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NATIONAL MUSEUM MELBOURNE

The Journal of the Department of Agriculture of Victoria, Australia.

February, 1922.

PRINCIPAL CONTENTS

Onion Growing

Crop and Fallow Competitions

Weeds and Their Eradication

Harvesting Bright Tobacco

Crystallizing of Fruit

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THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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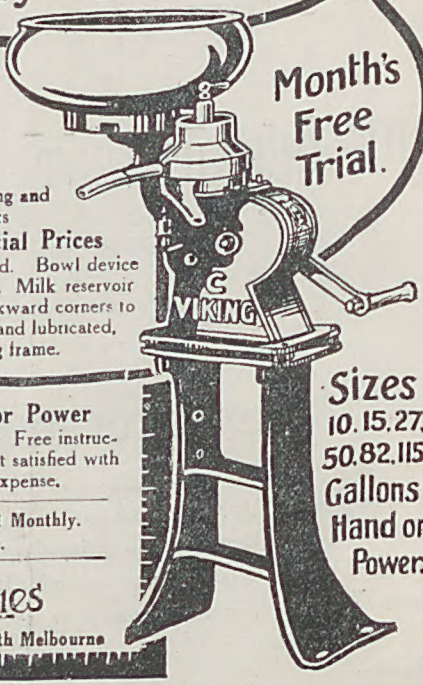

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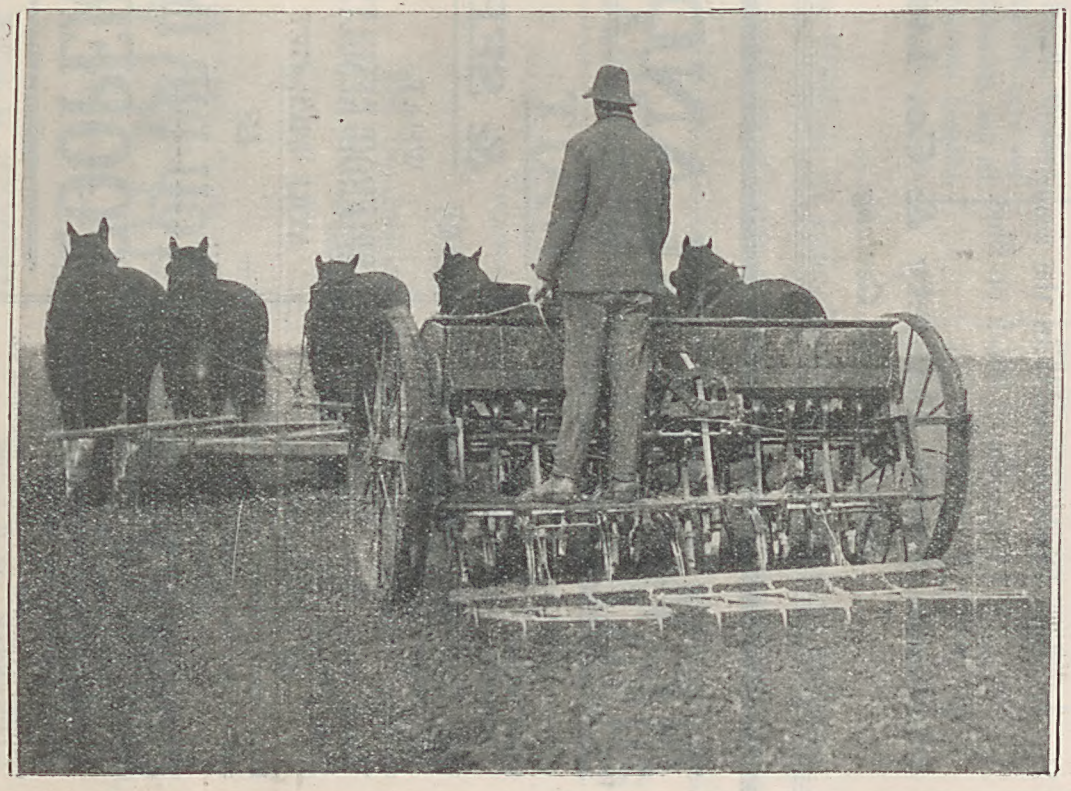

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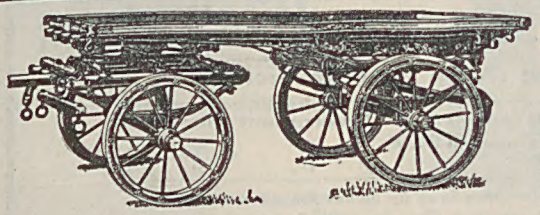

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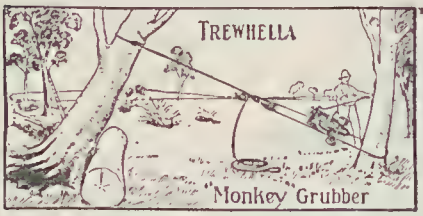

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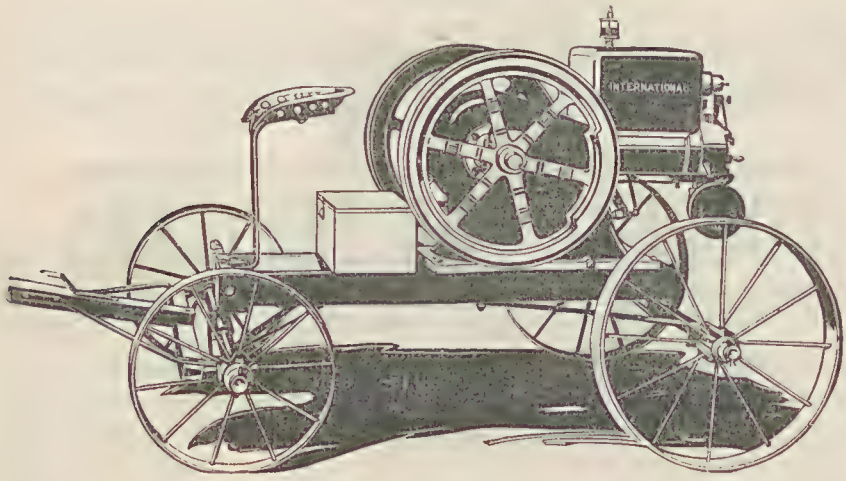

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THE JOURNAL

OF THE

Department of Agriculture

OF

VICTORIA.

Vol. XX. **February, 1922.** **Part 2.**

BEULAH CROP AND FALLOW COMPETITIONS, 1921.

Report of the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer.

I have pleasure in forwarding herewith my awards and report as judge of the 1921 crop and fallow competitions organized by your Society at Beulah. As you are aware, because of the unfavorable weather conditions, it was decided to defer the judging of the fallows till early in the new year. This report, therefore, concerns the crops only.

Beulah is one of the Mallee districts among the first settled in Victoria. The advent of the stump-jump plough, and the success of the mallee-roller in cheaply clearing this class of land of its timber, fired the imagination of settlers from the adjoining districts. In spite of all sorts of pessimistic predictions that the dense thickets of mallee covered nothing but a sandy desert, hardy pioneers took teams and trekked into the scrub. They rolled and burnt patches of mallee, and almost without any other preparation sowed the grain on the loose soil and ashes, and left for civilization. Returning eight months later they found splendid crops awaiting them. They had proved that the Victorian Mallee would grow payable crops of wheat.

The countryside has seen many alterations since then. Gradually the unkempt appearance of the partly-cleared land has been changed for well-ordered wheat fields and thickly-grassed paddocks. A water supply by channel, for both stock and domestic purposes, has replaced the old Government dams, and comfortable homesteads the tumbledown bush huts of the pioneering days. The texture of the soil has been altered, too, by cultivation and the tramping of stock, from a light, free, sandy loam to something approximating to a clay loam. Sandy rises that "blow" in the wind after rain, of course, still exist, but the country has consolidated wonderfully well.

Originally the land was selected in 640-acre blocks, but most farms now consist of aggregates of several blocks. Originally the settlers were forced to closely crop the cleared land by sowing wheat year after year on the stubbles. But for many years now the blocks have been well fenced; sheep have been installed, fallowing is practised, and general rotation farming adopted. Every year now in this country there is a fair area of oats for hay and grain sown on stubble land on each farm, and it is beginning to be realized that oats sown solely for feed is also a payable proposition. Some grew them on fallow and are pleased with the results.

In a few cases the aggregation of blocks has reached considerable proportions. These are generally, at least, 7 or 8 miles from the railway, and may consist of from five to ten blocks. But recently, thanks to the repatriation movement, the process has been arrested, and even reversed. Leisfield's is one large estate which was bought for subdivision by the State. Fifteen soldiers and their families have been

A Heavy Crop of Algerian Oats Grown on Fallow—Beulah.

settled on it. Within a radius of 25 miles of Beulah there have been settled some 150 returned soldiers. Most of these men look to District Inspector Redding and to members of the Beulah Agricultural Society for instruction on some of the finer points of wheat farming. The help has been cheerfully given, and the results are good.

One of the things the Beulah Agricultural Society has done is to organize this crop and fallow competition largely for the benefit of the men. There is a special section in which they may compete, and the response has been very satisfactory, fifteen men taking part this year. Some men have grown much better crops than others, and usually their success has been proved to be not a matter of luck, but of good management. The methods followed in the growing of the best crops are set out below. They may serve as object lessons for any who care to profit by them. Side by side are tabulated the methods of the older established farmers of the district who were competitors

in another section. Here also there are valuable lessons that those who run may read:—

Results.

Section I.—Returned Soldiers' Competition for the best 100 Acres of Wheat.

Name.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Maximum Points ..	**35**	**20**	**15**	**15**	**15**	**100**
J. R. Kennedy ..	35	17	15	15	14	96
J. Bryant	29	19	14	14	15	91
H. V. George ..	30	18	14	12	14	88
Chester Guley ..	30	16	13	12	15	86
C. H. Guley	26	16	13	14	15	84
J. C. Hunter	27	15	12	11	13	78
E. Pendlebury ..	21	19	9	14	14	77
T. H. M. Cullen ..	29	11	10	14	13	77
T. A. Millar	24	15	6	14	14	73
W. Shannon	20	17	12	10	12	71
Annear Bros. ..	19	17	11	12	11	70
P. J. Lawler	16	15	9	15	14	69
S. Walton	23	14	8	11	12	68
C. Hunt	17	16	8	10	10	61
J. H. Wheatland ..	15	17	6	12	10	60

Note.—The winning crop was estimated to yield more than 35 bushels per acre. The points for yields are not expressed in bushels per acre. The differences between them, however, are as near as possible in bushels per acre.

The winning crop, grown by Mr. J. R. Kennedy, was easily the heaviest in the competition. The crop (Penny) was a very clean and dense one, but rather too tall for safety in heavy weather or for ease in stripping. A notable feature of this crop was its singular freedom from red rust, a disease which, this year, attacked the Federation crops of the district more or less severely. Penny has proved also its rust resistance in Western Australia. For Mallee conditions it is a useful wheat. At the experimental plots at Warracknabeal, during the past five years, it has proved superior to Federation. It does not stand as well as Federation, however, but cannot be called weak in the straw. It has a large grain, and should be sown rather heavier than Federation.

Mr. Kennedy gave the land a thorough preparation and sowed the crop early in June; 80 lbs. of seed were used, and about 94 lbs. of superphosphate. The land was given no less than eight separate workings, including the initial ploughing. Most of the work was done with the combined drill, with which also the crop was sown. The land was ploughed in August, worked twice before harvest with the drill, then twice after harvest up till the end of May. It was then drilled and harrowed twice. Where the land is sufficiently free from stumps, there is no doubt that a spring-toothed implement is an ideal one for mallee land.

The crop exhibited by Mr. J. Bryant was Federation. It was reasonably pure, and very even throughout the field. The land was ploughed in April, May, and June, then harrowed, then spring-tooth cultivated twice, and finally harrowed and left till harvest. Subsequently it was spring-toothed twice, and then sown with the combined

spring-toothed cultivator-drill at the end of May, and early in June; 70 lbs. of seed and 74 lbs. of superphosphate were used. There is no doubt that the very thorough way in which the cultivation was carried out is the factor most responsible for the success of this crop.

Mr. H. V. George's crop of Federation was heavier than most. Points were deducted because of the presence of some wild oats and charlock. This paddock, of 180 acres, was summer-fallowed. The land was in oats previously. The oat stubbles were disced in March, then the scarifier was used in July, and a stroke of the harrows was given. In August the fallow was spring-toothed, scarified in September, and was left undisturbed until it was re-scarified at the end of the following April. The spring-tooth was used to work up the land in front of the drill, and the crop sown towards the end of June, 1¼ bushels of seed and 70 lbs. of manure being used. Here will be noticed the judicious interchange of spring-tooth and scarifier. In all seven workings were given. Mr. George believes that summer fallowing gives him better yields than land treated in the usual way.

Mr. Chester Guley also submitted a heavy crop. That of Mr. T. H. N. Cullen was, for the most part, very tall—a water channel had overflowed its banks and helped the crop, but it had also induced rust, which was very noticeable.

A number of the other crops were somewhat affected with smut.

Results.

Section II.—Open Competition for best 100 Acres of Wheat.

Name.	Yield.	Type.	Disease.	Weeds.	Evenness.	Total.
Maximum Points ..	**35**	**20**	**15**	**15**	**15**	**100**
Mrs. M. A. McCreddan	32	16	15	14	14	91
Schneider Bros. ..	30	18	15	13	14	90
A. P. Couzner ..	28	19	13	14	15	89
W. L. McAllister ..	28	19	13	15	13	88
W. J. Collins	29	19	10	15	15	88
H. V. George ..	30	18	14	12	14	88
J. R. May	25	20	14	14	15	88
Mrs. M. Schneider ..	31	16	13	11	15	86
R. George	29	18	12	13	13	85
Errol Schneider ..	26	18	13	12	12	81
W. T. Fish	24	17	12	10	14	77
T. H. M. Cullen ..	29	11	10	14	13	77
T. A. Millar	24	15	6	14	14	73

Note.—The points for yield do not give the actual yield in bushels per acre. The actual yields were estimated as greater than the figures indicated. The differences, however, represent bushels.

The winning crop in this section, that of Mrs. M. A. McCreddan, of Reedy Dam, though a fine one, was not as heavy as that of the winner of Section I. The 100 acres shown consisted of Dart's Imperial, Federation, and Penny. The Dart's Imperial was of exceptionally good appearance—dense, even, and level. There were a few strangers present, but it was entirely free from any disease. The Federation and Penny were somewhat less regular.

The fallow on which this crop was grown had been well worked, and liberally seeded and manured. To careful attention to those points

its success is due. The fallow was ploughed in June and July; it was then harrowed, then scarified. Later on in the spring a further harrowing, scarifying and harrowing were given. After harvest time, following a rain, the spring-tooth cultivator was worked. Finally, the land was spring-toothed, drilled, and harrowed in June, 85 lbs. wheat and 90 lbs. superphosphate being used. There were no weak patches in the crop, and it was well headed.

The crop awarded second place was that of Messrs. Schneider Brothers; 130 acres of Federation were shown. The crop was very even throughout, it was reasonably pure, and there were no weeds; it had been slightly damaged by hail. Again, this is a crop which was sown on well-worked land, with a liberal dressing of seed and manure. The fallow was July-ploughed, then harrowed. In the spring it was skim-ploughed, then spring-toothed, then harrowed, then spring-toothed, and reharrowed. After harvest it was spring-toothed again in April, skim-ploughed and sown; 95 lbs. of seed and 95 lbs. of super. were used.

A Repatriated Soldier's Crop of Federation. (Chester Guley, Beulah.)

The crop of Federation, exhibited by Mrs. M. Schneider, appeared to be rather heavier than that just referred to; it had also been affected by hail. Points were deducted for the presence of charlock, and a little black rust; 100 lbs. of seed and 100 lbs. of superphosphate were used per acre.

Mr. W. J. Collins' crop of Federation was also a good one. It was especially well headed, even, and very pure indeed. Points were lost on the score of disease; 110 lbs. of seed was used, with 110 lbs. of superphosphate. The crop was drilled in June.

Mr. A. P. Couzner's crop of Federation was drilled late in June. The seed was true to type, and the paddock very even; 70 lbs. of seed and 120 lbs. super. were used.

Mr. W. L. McAllister's crop was somewhat uneven. Some of it was very heavy. The land was winter-fallowed, well worked, and then sown at the end of May, and early in June, with 70 lbs. of seed and 100 lbs. superphosphate. The crop was very free from strangers. The best crop, however, from this point of view was that of J. R. May. Full marks were scored for purity.

Seeding and Manure at Beulah.

It will come as a surprise to many to learn of the heavy applications of seed and manure that have been given by most of the competitors in the open section. There was a time when 45 lbs. of seed and 30 lbs. of superphosphate were thought to be ample for mallee land. But the times have changed since then. The land is now given a most thorough preparation for the crop, which results in increased supplies of moisture being stored in the fallows, and in extra supplies of plant food being liberated, especially of the sorts other than phosphatic. It follows that each acre of land will support more plants, hence the increased rate of seeding, which must be accompanied by extra quantities of phosphorus, the most deficient element in the soil. While there is no doubt that the old-time rate of seeding is now too light, it is open to question whether amounts of seed as high as

Cutting a heavy crop of Algerian Oats grown on Fallow.
(Mr. W. T. Fish, Beulah.)

some of those given are beneficial. The results at Longerenong show that there is no advantage in sowing more than 70 to 80 lbs.; but, of course, that is on a different class of soil. Similar tests have not been carried out on mallee land in Victoria. Those who seed heavily at Beulah are, however, supported by the practice on mallee land near Dimboola—where some successful farmers are sowing from 1½ to 1¾ bushels. They do it because the germination there is found to be rather less than might be expected.

Fallowing Mallee Land.

There is no doubt that it pays to work fallow well in the Mallee, just as it pays to do so in the Wimmera. But it must be done with skill. It is easier to ruin fallowed land in the Mallee by injudicious cultivation than almost anywhere else. If the land is stirred too deeply, or is persistently cultivated when dry, the "take-all" disease is almost bound to make its presence felt severely. The successful

competitors in this competition have shown how the work should be done. The initial ploughing should be made early, and done thoroughly; 3½ inches is deep enough. Then rubbish must be killed in the spring as it germinates. The scarifier and the spring-tooth appear to be better implements than the skim-plough. The spring working should not be made as deep as the original ploughing. Subsequently, after any summer rains, the harrow or spring-tooth cultivator should be kept going while the ground is reasonably moist. Great care must always be taken to keep heavy implements from stirring the fallow too deeply. Many a Mallee fallow has been ruined because of the necessity for discing paddymelons. The heavy disc stirred up the land too deeply, and it could not be consolidated. One crop in the Soldiers' competition had been seriously affected in this way.

Paddymelons should be tackled as soon as they show through, even though the land be worked somewhat on the dry side. The use of the disc can often be thus avoided. One or two crops on the back country were not as heavy as they might have been, because of the influence of the mallee shoots prior to fallowing. Sheep are, of course, invaluable for trimming weeds and consolidating the land.

Stinking Smut.

A number of crops in the district were smutted, especially among the soldier settlers. In some cases heavy loss had occurred, and in others there was enough smut present to seriously infect the seed for next year's crop. It is, of course, not good policy to sow infected seed, but, in any case, the pickling should be done with a most careful attention to detail. If bluestone is used the correct strength is 1½ lbs. to 10 gallons of water. The seed should be poured from the bags into a perforated vessel standing in the solution, then stirred and skimmed. The wheat should be immersed for three minutes by the watch. All bags should be pickled, and the drill, if infected, cleansed with formalin. When making up a fresh supply of pickle to replace that used, the same formula should be used. It is courting failure to guess the quantities of water, or of the pickle. To dissolve bluestone quickly, suspend it just under the surface of the water in a hessian bag.

With formalin the standard strength is 1 lb. of formalin to 40 gallons of water, and the immersion three minutes. Wheat pickled in formalin may not be kept for longer than a few weeks without injury to its powers of germination.

Wimmera Rye Grass.

An interesting stand of Wimmera rye grass was seen at W. L. McAllister's place. Mr. McAllister finds it excellent feed, and manages to grow good wheat crops as well. He finds that summer fallow will keep the grass in check. Between June and harvest on 100 acres of the rye grass, 500 sheep, 20 cattle, and 35 horses were maintained. Its extensive seeding is not advocated on properties where the fallows are not thoroughly cultivated.

In conclusion, I desire to thank the secretary, Mr. A. J. Williams, for the efficient management of the transport arrangements, which greatly facilitated the work of judging.

CROP AND FALLOW COMPETITIONS, KANIVA, 1921.

Report of the Judge, J. Keane, B.Ag.Sc., Science Field Officer.

The Crop and Fallow Competitions conducted this year by the Kaniva Agricultural and Pastoral Society were divided into four sections as follows:—

Section A.—Best 75 acres of crop.

Section B.—100 acres of fallow, 1920, and the crop of 1921—the total of points for both the fallow and crop to be considered.

Section C.—Best 100 acres of fallow.

Section D.—100 acres of fallow, 1921, and the crop of 1922—the total points for both the fallow and crop to be considered.

The entries received for these four sections totalled thirty-two, compared with twenty for last year. This is a satisfactory entry, and it is to be hoped that the members of the society will continue to support the competition. These competitions are held not only to promote a feeling of friendly rivalry among farmers, but mainly with a view to determining the best crops in the district and the methods by which those crops have been raised. The knowledge obtained in this way is disseminated among the farmers and should eventually be the means of improving farming practices, thus increasing the yields obtained.

DETAILS OF RESULTS.

Section A—Best 75 Acres of Crop.

Name.	*Yield.	Trueness to Type.	Evenness.	Disease.	Weeds.	Total.
Possible points ..	35	20	15	15	15	100
Kennett Bros. ..	34	19	14	15	13	95
A. E. Sanders ..	35	19	15	10	14	93
Crouch Bros.	33	18	13½	13	12½	90
A. W. Goodwin (*b*) ..	35	17½	13	12½	12	90
O. A. Hendy	32	18½	13½	14	11	89
A. E. Williams ..	31	19	12½	12	13	87½
R. M. Williams ..	33	18½	14	10	11	86½
R. Barber	33	17	14	8	13	85
H. Crouch	32	17	11	12	12	84
A. W. Goodwin (*a*) ..	29	18	12	11	11	81

* In connexion with the points allotted under "yield," it should be noted that these do not correspond with the estimated yield in bushels. The estimated yields were, in each case, higher than the figures shown.

The crops shown were all of a very high standard, and some excellent yields should have been obtained. The first prize is awarded to Messrs. Kennett Bros., whose crop consisted of the best 75 acres of an 190-acre paddock of Federation. The crop was practically true to type, even, free from disease, and with but few weeds.

It was sown on summer fallow which had been ploughed in March to a depth of 4½ inches and then left till September, when it was scarified and harrowed. It was scarified again in October and again harrowed. At the end of May 60 lbs. of seed and 90 lbs. of superphosphate were sown—one-half with the spring-toothed combination drill and the other with the ordinary drill preceded by the scarifier. Since 1917 the paddock has been in wheat, oats, grass, fallow, and wheat.

The second prize goes to Mr. A. E. Sanders, who exhibited an excellent crop of 80 acres of Federation. The crop, which promised to yield exceptionally well, was reasonably true to type, remarkably even, and, with the exception of an occasional sow thistle, free from weeds. The paddock was summer-fallowed in March to a depth of 5 inches. In July it was spring-toothed, scarified in September, and then harrowed twice before November. Towards the end of June it was scarified, sown with the ordinary drill and harrowed. Seventy pounds of seed and 100

A Heavy Crop of Federation. (Mr. A. E. Sanders.)

lbs. of superphosphate were used. The rotation practised by Mr. Sanders is either oats, fallow, wheat, or grass, fallow, wheat—the land being in either oats or grass every third year.

For third place Messrs. Crouch Bros. and Mr. A. W. Goodwin are equal with 90 points each. Messrs. Crouch Bros. showed 75 acres out of a 90-acre paddock of Federation. Although the seed has been grown on the farm for some considerable time now, it is still reasonably pure, although a few plants of barley and an occasional "stranger" were seen. The crop was fairly even, and except for a few small patches of "take-all," free from disease. There was a slight undergrowth of cockspur and ironweed and a fair number of wild oats.

The land was ploughed in July to about 4 inches. In August the paddock was spring-toothed, the other half being harrowed. The whole was then spring-toothed in September across the last working, and again spring-toothed early in November. Sixty pounds of seed and 90 lbs. of superphosphate were sown with the spring-toothed combination drill

about the second week in June. Since 1917 the paddock has been cropped as follows:—1917, wheat; 1918, oats; 1919, grass; 1920, fallow; and 1921, wheat.

Mr. A. W. Goodwin's "b" crop (grown on that part of his property known as "Boxdale") consisted of portion of an 115-acre paddock. The variety was again Federation. The crop looked exceptionally heavy, and was well headed, particularly on a portion which was sown later than the rest. There was a fair amount of "take-all" in the earlier-sown portion, mainly in crab-holes, where the land was not worked owing to the presence of water. A fair number of weeds were present. The paddock—a rich black flat—was summer fallowed in March, and during the year received nine workings. In May it was scarified and sowing was commenced towards the end of that month, but, owing to unfavorable weather, was not completed till the end of June. Sixty pounds of seed and 120 lbs. of superphosphate were used.

Messrs. Crouch Bros.' Crop of Federation.

Portion of the land was harrowed after the drill, and in August about 600 sheep were put on and left for a couple of weeks, the crop being eaten down fairly close.

Next in order of merit is the crop shown by Mr. O. A. Hendy. This consisted of a 55-acre paddock of black land with a few small red patches and crab-holes and 20 acres of more even and level black country. The crop was fairly heavy, but not uniformly so, the last portion seen being much heavier than the first portion. Twelve acres were sown with seed obtained from Longerenong College, and this was true to type, but in the remainder a few foreign varieties were seen. Points were deducted for presence of weeds, there being a considerable undergrowth of cockspur, and wild oats were numerous, except on about 35 acres which had been harrowed several days after sowing. Seeding took place in June; 63 lbs. of seed and 120 lbs. of superphosphate were sown.

Mr. A. E. Williams showed a nice crop of Federation. The seed was fairly pure and, although light on the red patches, the crop should

yield well. There was practically no undergrowth of weeds, but a number of wild oats and a few thistles could be seen. The paddock was summer-fallowed in March, harrowed in July, skim-ploughed late in September, harrowed twice during October, and scarified in November. Sixty-three pounds of seed and 90 lbs. of super. were sown during the last two weeks in June; a portion was sown with the combined drill and the remainder scarified and then sown with the ordinary drill.

Mr. R. M. Williams' crop consisted of 35 acres of Dollar and 70 acres of Federation. Both crops were very well headed and fairly even. The Dollar was true to type, but the Federation contained a few heads of other varieties. There were a fair number of weeds present. Seeding (60 lbs. of seed and 90 lbs. of super.) took place early in June—the combination drill being used.

A heavy crop was shown by Mr. R. Barber, but, unfortunately, it had gone down badly in places.

Mr. H. Crouch's crop of Federation also promised to yield well, but it was a little too rank in places and rather uneven. Some weeds were present, also a few patches of "take-all." The crop was sown about the middle of May—60 lbs. of seed and 100 lbs. of superphosphate being used.

Mr. A. W. Goodwin's (a) crop was sown on that portion of his property known as "Lackmann's." It was much lighter than the other crops seen, was slightly smutted, and showed a considerable undergrowth of weeds. The sowing of this crop was started in May, but was not completed until late in June. One-half was sown with the combined drill.

Section B—Best 100 Acres of Fallow 1920, and the Crop of 1921.

Name	*Yield.	Trueness to Type.	Evenness.	Disease	Weeds.	Total for Crop 1921.	Total for Fallow 1920.	Grand Total.
Possible points ..	35	20	15	15	15	100	100	200
Kennett Bros. ..	34	19	14	15	13	95	89	184
A. W. Goodwin	35	17½	13	12½	12	90	85	175
Crouch Bros. ..	33	18	13½	13	12½	90	83	173
A. E. Sanders ..	35	19	15	10	14	93	80	173
H. Crouch ..	32	17	11	12	12	84	88	172
R. M. Williams	33	18½	14	10	11	86½	78	164½

* See note under Table 1 (Section A).

In this section the fallow was judged by Mr. I. M. Tulloh in 1920. The points awarded for the fallow in that year are added to the points for the crop grown on that fallow and the totals compared.

Messrs. Kennett Bros. were placed first in this section with a total of 184 points. The crop shown was the same as has already been described under Section A.

Mr. A. W. Goodwin is second with 90 points for the crop and 85 for the fallow, making a total of 175 points. This crop is the "b" crop shown by Mr. Goodwin in the first section.

The remaining crops have also been described under Section A.

Section C—Best 100 Acres of Fallow.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
Possible points	25	25	25	25	100
A. W. Goodwin (*a*)	25	21	22	24	92
S. R. Champness	25	21	23	21	90
Crouch Bros.	25	20	22	22	89
A. E. Williams	25	21	20	22	88
R. M. Williams	25	22	18	23	88
O. A. Hendy	25	21	21	20	87
Kennett Bros.	25	19	22	19	85
A. E. Sanders	25	20	17	21	83

In a normal year the amount of moisture found in the fallows is the best indication of the efficiency of the cultivation methods adopted. This

Messrs. Crouch Bros.' Well-Sheltered Homestead.

year, however, owing to the heavy rains which fell just prior to the judging, all the fallows showed a high moisture content. It was therefore possible to separate them only on such points as the character and depth of the mulch, the efficiency of the cultivation in obtaining a level, well-consolidated bottom, and the presence or absence of weeds. Mr. Goodwin's winning fallow consisted of a 60-acre paddock of well-mixed red and black land, together with 40 acres of black land from another paddock. The mulch, although a little shallow in places, was mainly about the right depth and in fair tilth. The "bottom" was well consolidated, but slightly ridged. Very few weeds were noticeable. The 60-acre paddock was summer fallowed in April, harrowed twice in August, and skim-ploughed in the same month. It was then harrowed twice in September, and in October worked with the Suntyne combination drill with harrows behind. It was harrowed early in November and again late in the same month. The remaining 40 acres were winter fallow.

A very creditable fallow was shown by Mr. Roy Champness, to whom second place is awarded. The paddock exhibited consisted of 107 acres —mainly black land, and practically on the fringe of the Mallee. Portion of the paddock was summer-fallowed in April to a depth of 5 inches, and spring-toothed in June. The balance was ploughed during June and July. The whole of the paddock was harrowed in August, spring-toothed in September, scarified late in October, and harrowed twice in November.

The remaining fallows, though generally good, lost points for such faults as shallow mulches, insufficient consolidation of the under layers, and the presence of weeds—particularly barley grass. This grass is a host for "take-all," and serves to carry the spores or seeds of the disease over from one wheat crop to the next; its eradication from the fallow should, therefore, be one of the main considerations. As sheep will not readily eat mature barley grass while other feed is about, the farmer ought to endeavour to kill this weed by cultivation before it reaches the seeding stage.

Section D—100 Acres of Fallow 1921 and the Crop grown on that Fallow in 1922.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
Possible points	25	25	25	25	100
S. R. Champness	25	21	23	21	90
Crouch Bros.	25	20	22	22	89
A. E. Williams	25	21	20	22	88
R. M. Williams	25	22	18	23	88
A. W. Goodwin (*b*)	25	19	20	23	87
O. A. Hendy	25	21	21	20	87
Kennett Bros.	25	19	22	19	85
A. E. Sanders	25	20	17	21	83

The prize in this section will be allotted after the judging of the crops grown on these fallows next year. With the exception of that shown by Mr. Goodwin, the fallows are the same as in Section C. The fallow entered by Mr. Goodwin for Section D is on that portion of his property known as "The Nook."

NOTES ON THE COMPETITIONS.

The rate of seeding favoured by most of the competitors was 60 lbs. per acre. Out of the ten crops seen, eight were seeded at this rate, while the other two were sown at the rate of 70 lbs. per acre. The amount of superphosphate applied varied from 90 to 120 lbs. per acre. In this connexion it is significant that experiments carried out at Longerenong College over the last eight years have shown that for both early and late sowing seeding at the rate of 75 lbs. per acre, with a dressing of up to 2 cwt. of super., has given the most profitable results.

Time of Sowing.

The time of sowing ranged from May to July, the greater portion of the crops seen being put in during June. The advantage of later

sowing was seen in Mr. Goodwin's "b" crop. In this paddock drilling was commenced towards the end of May, but owing to unfavorable weather was not finished till the end of June. The later-sown portion was considerably heavier than that sown earlier, and should yield at least one and a half bags per acre more. From experiments conducted by the Department of Agriculture in the Wimmera, it has been definitely determined that late sowing (July) is preferable to early (May and early June), giving increased yields, cleaner crops, and a decreased liability to "take-all." In an experiment carried out over four years with six different varieties of wheat the difference in favour of late sowing has averaged 4 bushels per acre.

The trouble in the Kaniva district, however, is the danger of heavy rains later in the season making it difficult to get the seed in—particularly in the crab-holey land. At the same time, many of the competitors

Mr. Roy Champness's Well-Kept Orchard and Vegetable Garden.

prefer to delay the commencement of sowing till at least after the middle of June. Where the nature of the land is such that it is essential to begin sowing early, harrowing after the crop is up is a practice that may be followed with advantage. An example of this was seen in the crop shown by Mr. O. A. Hendy. When sown in June the paddock was rather dirty, and some time after seeding Mr. Hendy ran the harrows over about 35 acres of it. This portion of the crop was practically free from weeds, while the remainder, which had not been harrowed, contained a good deal of rubbish.

"Ball Smut."

A few of the crops seen contained a fair number of plants that were affected by "Ball Smut" or "Stinking Smut." This objectionable disease is one that can easily be kept out of the crop, providing proper methods of pickling are adopted. When the seed is pickled in the bag,

any unbroken smut balls that may be present are uninjured by the pickle. Later, usually in the drill, these smut balls become broken, and the seed is re-infected with the disease. The correct method is to immerse the seed for from 3 to 5 minutes in a pickle of bluestone, 1½ lbs. to 10 gals., or formalin, 1 lb. to 40 gals. At the same time the seed should be well stirred, and any smut balls which rise to the surface skimmed off. The bags should also be pickled.

An Orchard on the Wheat Farm.

A feature of the competition was the fine orchard seen during the visit to the farm of Mr. Roy Champness. This is a striking example of what can be done in the district in the way of improving living conditions and, at the same time, beautifying the home. Ten years ago, when Mr. Champness first started on his block, there were practically no improvements at all. To-day he has a splendid farm, with a fine homestead, plantations of sugar gums, &c., and an excellent orchard. The orchard, which has an area of one acre, was planted out in 1914, and contains apples, pears, peaches, plums, apricots, figs, and grapes. These are all bearing well, and look exceedingly healthy although, with the exception of the grape vines, they have not been watered at any time. Mr. Champness, like others who have been successful in raising orchards in the wheat belt without irrigation, finds that thorough cultivation of the soil is the main essential for success.

Alongside the orchard is a vegetable garden, in which all kinds of vegetables are being successfully grown.

In conclusion, I desire to thank the competitors for their hospitality, and the president of the society, Mr. A. E. Williams, the secretary, Mr. Cordner, and Messrs. Lackmann and Curry for their assistance and co-operation during the judging of the competition.

FEEDING WHEAT TO STOCK.

Several correspondents have written to ask that, in view of the fall in price, wheat should be included in the list of feeding stuffs dealt with in the following table. It has therefore been included, and it will be seen that the price has reached a stage where it is as economical to the farmer to feed the wheat to stock as to market it for flour. It is also interesting to note that at the prices recorded in the table, both bran and middlings are more expensive to feed than wheat itself. The points to be observed in feeding wheat are familiar to most stock feeders, but it will perhaps do no harm to repeat them. (1) Wheat should be ground for all stock except sheep, since the kernels are small and hard. (2) Wheat so ground should be ground only to a very coarse meal. If ground to a fine meal, the meal pastes in the mouth and forms an unsatisfactory feeding stuff. (3) Wheat should only form a small proportion of the concentrates fed to stock, except perhaps in the case of the pig. With the horse, feeding wheat in any quantity leads to digestive disturbances and skin eruptions.—[*Journal of the Ministry of Agriculture*, England.]

WEEDS AND THEIR ERADICATION.

(Continued from page 18.)

By H. W. Darcy, F.E.S., Orchard Supervision Branch, Department of Agriculture.

The Artichoke Thistle, *Cynara cardunculus,* L. Asteraceæ.

This most aggressive-looking plant belongs to the same genus as the artichoke, *C. scolymus,* L., so much grown in Europe for culinary

Fig. 16.—The Artichoke Thistle, *Cynara cordunculus,* L.

purposes. It thrives best in good strong soils, and increases very freely from seeds. The genus Cynara contains several species, most of which are natives of Southern Europe. The species, *C. cardunculus,* commonly known as False Artichoke, and sometimes by the name of Cardoon, is prevalent on the outskirts of Melbourne, and other places in Victoria. It has been proclaimed, under the Thistle Act, a noxious weed throughout the whole State. This false artichoke is a perennial, often reaching 6 feet in height, and is wide in proportion, as can be

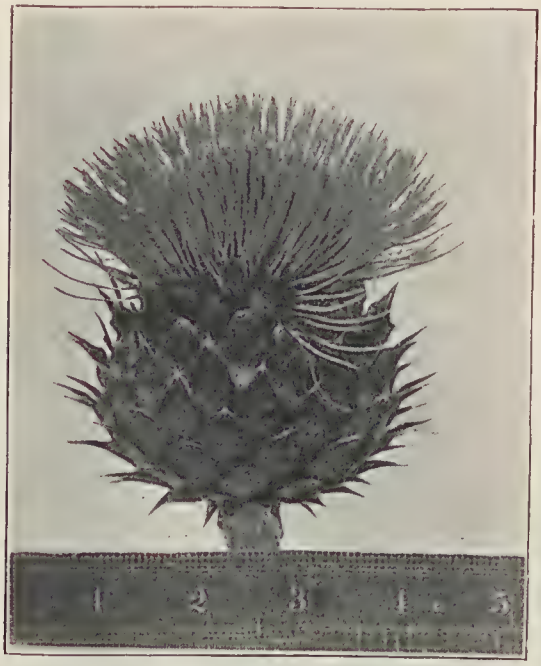


Fig. 17.—A Bloom of the Artichoke Thistle.

Fig. 18.—Artichoke Thistle in possession of land at Sunshine.

seen by referring to Fig. 16. Its lower leaves are very large, and pinnatisect (leaf cut into segments nearly to the midrib), the lobes of each segment ending in strong yellow spines. This plant is usually in full flower about Christmas, the flower heads are solitary, very large, and of a blue colour (Fig. 17). Many of these blossoms are forwarded to the Queen Victoria Market, arriving in trays, just before the Christmas and New Year holidays, and find a ready sale there as Giant Thistles, at from 3d. to 6d. a bloom.

Fig. 18 affords a good idea of the way in which this species takes possession when the ground is left undisturbed.

Fig. 19.—Portions of Roots of Artichoke Thistle.

Hand pulling is, of course, impracticable; first, on account of the plant's spiny character, and also to the strength of its woody roots. These are so big that it is no easy matter to dig up one of the plants, as can be judged by the sections of roots illustrated in Fig. 19.

Owing to the spreading habit of the False Artichoke's large leaves, one cannot approach close enough to dig or mattock it out, consequently these leaves have first to be removed by means of a slasher. Afterwards the plant should be grubbed completely out, in which operation a chisel-ended pick will be of great service. Sparrows and

goldfinches destroy large quantities of the seed of this plant by picking them out before they are fully ripe.

Fig. 20.—Foxglove, *Digitalis purpurea*, L.

Purple Foxglove, *Digitalis purpurea*, L. Order Scrophulariaceæ.

This plant (Fig. 20) is a native of England, where it is fairly common. It appears to favour soils deficient in lime. Although not

yet proclaimed under the provisions of the Victorian Thistle Act, undoubtedly it should be, as it is a most poisonous species, and is spreading at an alarming rate over the hills at Walhalla. It is in all probability an "escape" from one of the small abandoned gardens in the township, and during recent years has spread itself for miles over the

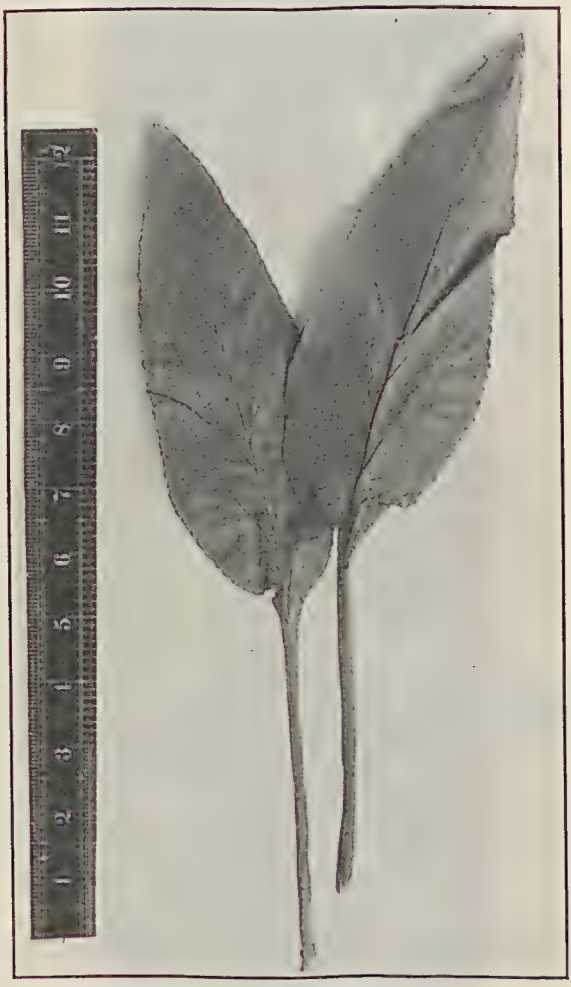


Fig. 21.—Leaves of Foxglove.

surrounding country. In early summer the flowers present a very pretty appearance there, rising tier after tier, the colours ranging from white to purple.

The foxglove appears to be free from attack either from stock or insects, and as a result of this immunity it may, in a few more years, become one of the commonest of weeds.

Fig. 22.—Mullein, *Verbascum Blattaria*, L.

Grazing animals leave the foxglove severely alone, but danger lies in the fact that where the plants become plentiful there is a risk of portion of them being included in hay or silage. All parts of the plant are poisonous, its seeds especially so, and as the toxic principle is not destroyed by drying, there would be a great risk of poisoning stock if fodder containing seeds or any part of this plant were supplied to them. Foxgloves frequently attain a height of 6 feet, and the tall stem usually bears numerous bell-shaped purple or white flowers, arranged in the form of a tapering spike or one-sided raceme. Its large wrinkled leaves are illustrated in Fig. 21. The plant is a biennial, and during its first year of growth consists of a dense rosette of leaves. These yearling plants should be hoed out; the following year these rosettes, if not interfered with, will throw up a stem whose flowers will later on produce many two-celled capsules containing numerous seeds. The plants are easily hand-pulled, after which operation they should be collected and burnt.

Twiggy Mullein or Spurious Mullein, *Verbascum Blattaria*, L.

Scrophulariaceæ.

Probably about 70 species of Verbascum, mostly natives of Southern Europe, are recorded. The species *Blattaria*, which is proclaimed under the Thistle Act for the Shire of Buln Buln, and which has of recent years become exceedingly common in many other districts. It is native to England.

This plant is a vigorous-growing biennial, producing a great number of bright yellow flowers, the stamens of which are covered with purple hairs. By the end of January it has usually finished flowering, but the dry flower stems, with their clusters of seed vessels, often remain standing until the following spring. This weed favours grass lands, and in all probability its seeds are often collected with those of grasses; this has enabled it to become so widely spread.

Fig. 22 shows a flowering stem of this plant, of which Fig. 23 is a portion giving a more detailed view.

Fig. 23.—Portion of Flower Stem of *V. Blattaria*, L.

The best means of control is to hoe out the autumn rosettes or to hand-pull them later when the flower stem has arisen, but care must be taken to do this hoeing or pulling before the plant has ripened its seed.

(To be continued.)

THE CONTROL OF SLUGS.

As slugs readily take advantage of all kinds of refuse for shelter in the day-time, it would seem advisable to plough in crop residues immediately after the removal of the crop, and organic manures as soon as applied. . . . This is specially important during the period when no crops are available on arable land. All vegetation on waste ground, hedge, ditch, and pond-sides should be periodically turned. Cleanliness and tidiness in stockyards, around root clamps, and in gardens should always be maintained, since all material lying about harbors slugs to a remarkable extent.—[*Journal of the Ministry of Agriculture,* London.]

RESULT OF MANURE TRIALS ON POTATOES UNDER IRRIGATION.

By J. T. Ramsay, Potato Expert.

During the past few years lucerne growers at Werribee have had to consider the problem of how to keep lucerne stands at a standard of productiveness which would prove to be profitable. It was found that after a course of about seven years continuous cutting for hay—or alternately cutting and grazing—the sole of the pastures gradually thinned so much that some method of renovation was necessary.

The simple procedure of scarifying the worn lucerne and re-seeding was tried, but proved unsatisfactory. It seemed necessary to put the

I.—Portion of Field after Digging.

(Part on left was dug by hand, that on the right was dug by machine.)

land right out of commission, as far as lucerne was concerned, for a year or two, and then lay it down afresh. A trial of cereal crops for this purpose was made with little success, as these provided no opportunity for inter-cultivation during their growth. Lack of frequent inter-cultivation merely stimulated the surviving lucerne plants to greater vigour, and they became a greater nuisance than ever. Ultimately it became obvious that some crop permitting opportunity for stirring the soil sufficiently often to kill the lucerne plants would have to be grown. The attention of growers was then focussed on root crops, and eventually the potato as being a high money-value crop was tried.

The experience of the past two years with this crop has proved that—

First—It is eminently suitable as a rotation crop with lucerne, as the high standard of tillage which it demands is the best

means of combating the tenacious grip which old lucerne roots have on the soil.

Second—The potato crop can be successfully and economically grown after lucerne on the lighter soils of the district.

Third—The crop can be grown for the early mid-season or late markets.

Fourth—The quality of the potatoes grown ranks among the highest in the State.

Lucerne is admittedly one of the best soil-improving crops which can be grown, and at Werribee an appreciable physical improvement of land which has grown lucerne for six or seven years was noticeable: while, as was to be expected, the fertility also was increased greatly. During the past year a trial was conducted by this Department to determine whether or not this physical and chemical improvement due to lucerne growing was sufficient to produce potato crops without further augmentation by artificial manuring; and, if not, what manures and quantities of same would produce the optimum result.

The manures and rates per acre tried, together with the results obtained, are shown in the following table:—

	Tns.	cwt.	qrs.
Plot I.—No manure	4	18	0
„ II.—5 cwt. superphosphate per acre ..	6	16	2
„ III.—10 cwt. superphosphate per acre ..	5	15	2
„ IV.—5 cwt. blood bone and superphosphate per acre	5	15	2
„ V.—10 cwt. blood bone and superphosphate per acre	6	16	2
„ VI.—10 cwt. basic superphosphate per acre ..	5	4	3

The crop was planted at the end of August, and harvested in the first week of January. The variety grown was confined to Carmen, but the parcel of seed was considerably mixed—a very large percentage of it being Late Carmen.

One irrigation was given—on 10th November—but from experience gained it is certain that a much increased yield would have been obtained from a second irrigation. The evidence supporting this is the fact that on one or two rows subjected to an accidental second irrigation the crop was vastly improved, and though not weighed, was estimated to go about 8 tons per acre.

The above results suggest that 5 cwt. superphosphate per acre is the most profitable dressing, but it is highly probable that with more water the heavier dressings would have scored. A fact worthy of mention and consideration is that the no-manure plot, being situated at the edge of the paddock, was somewhat influenced by seepage water from an adjoining paddock.

Notwithstanding these fluctuations in the conditions governing the area of one acre on which the tests were carried out, it remains proven that judicious manuring to supplement the improved soil condition effected by growing lucerne for a number of years is most advisable and profitable, though at the present stage it is impossible to make a definite statement as to the exact manuring which would give the best all-round result.

The fact that no second irrigation was given was due entirely to the deceptiveness of the season. Frequent light showers fell during the growing period, and these, while insufficient to supply the moisture necessary for the full development of the crop, were, in conjunction with threatening skies, quite sufficient to justify withholding irrigation. Had a second irrigation been given, and the threatened rain also fallen, the result would have been very harmful. Every credit is due to Mr. G. Barker, on whose farm the trial was conducted, for the whole-hearted manner in which he cared for the cultivation and irrigation of the field, the results from which are highly satisfactory.

A most noticeable feature of the harvesting operations was the difference between the condition of the ground harvested by hand and that harvested by the machine digger. Two of the illustrations given here demonstrate this difference very forcibly.

It is obviously impossible, without resorting to very expensive hand hoeing, to eradicate every weed plant growing in the potato rows. That being so, some of these weeds must mature.

II.—Another Portion of Experimental Field.

Illustration No. I. shows an end-on view of a portion of the field after being dug. The weedy section on the left of the picture illustrates the ground as it appeared after digging by hand. The right-hand portion of the picture shows the ground as left after digging by machine. Illustration No. II. further demonstrates this difference from a broadside point of view.

It is somewhat difficult to understand why so few digging machines are used in the State. Certainly the high prices charged for them act as a deterrent on many would-be purchasers. Everything, however, is on their side with regard to cleanness of digging and lifting the tubers without damaging them, while there is absolutely no comparison in the condition in which the soil is left, the machine leaving it almost perfect.

Next season it is intended to amplify the experiment in potato growing on the irrigated country at Werribee, and the proposed scheme includes the following tests:—

I.—Further manure trials.
II.—Selected seed against the run of seed.
III.—Boxed seed against bagged or pitted seed.
IV.—Immature against ripe seed.
V.—Variations in number of irrigations given.

Seed for next Season's Tests.

An illustration is given of a box of the selected immature seed which will be used in next season's test, from which most valuable data is expected.

Had it not been for the Australian bug which was introduced by unknown means many years ago, and which proved to be such a serious pest to citrus trees, the Union would now probably be far in advance of its present position in the citrus industry. The position seemed hopeless until American entomologists recognised the practical value of the ladybird, *Novius cardinalias,* a natural enemy of the bug in its native home. By introducing the ladybirds into California the bug was soon brought under control. On being introduced and disseminated in South Africa, largely through private enterprise, the ladybird maintained its reputation as a beneficial insect. The great benefit thus derived from America has been passed on by us to other countries during the last twenty-five years. The Divisions of Entomology has spared no efforts to meet all demands, South America having been supplied with a strong initial colony only a year ago.—[*South African Journal of Agriculture,* December, 1921.]

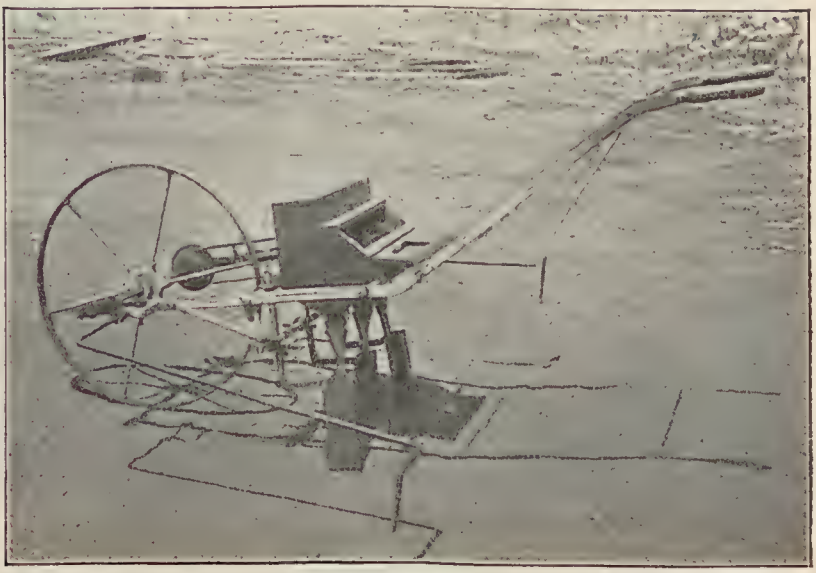
ONION PRODUCTION.

(Continued from page 9.)

By S. G. Harris, Senior Potato Inspector.

Harvesting.

The time of harvesting extends from late September or early October to March. The first onions to come on to the market are the Silverskins, from the market-garden areas of the Brighton District. They are followed by the Early Globes from the same areas. The first deliveries of Silverskins are pulled before they are ripe, and the tops cut off while the necks are quite thick, the growers being anxious to catch the early season high prices. These, however, are only fit for immediate use, and are marketed in cases and half-cases in small quantities. Being only half ripe they contain a large percentage of moisture, and, if bagged, will very quickly heat and become useless.



An Onion Seeder.

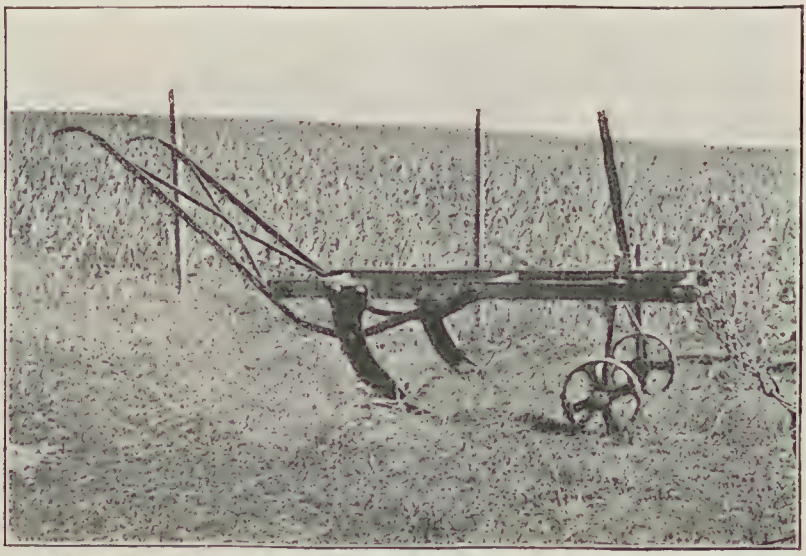
As the season progresses, and the bulbs ripen, they are quite a useful early export onion (especially in seasons when the supply of late onions is limited), to carry on until the Early Globe is ready to fill export orders. The Early Globe is usually fit for sale about the second or third week in October, and holds the market until the Late Globes come in late in January or the beginning of February, to be followed by the main crop of Brown Victorian, in March.

In the market-garden areas and small plots the harvesting is mostly done by hand-pulling, and in the larger areas by skimming. The time of harvesting onions varies to a certain extent among growers.

The general practice is to allow the crop to remain in the ground until the tops have bent over by their own weight and begin to yellow and wither.

Onions should not be allowed to become too ripe before harvesting as they have a tendency to take root again, especially if the season is

wet. In some instances the plants ripen irregularly, and it may be necessary to break them down with a light roller. This may also be necessary in the case of a late crop to hasten ripening, and allow the bulbs to be harvested while favorable weather conditions prevail. There is, however, no advantage than that mentioned in thus forcing ripening. The old idea that by thus breaking down the tops, the sap will be restricted, and the bulbs increased in size has been proved to be without foundation. At the proper period the stem will bend naturally, and so restrict the sap and keep it in the bulb. This is the accepted view of our best and oldest growers, but some growers in America advocate harvesting the bulbs on the green side; in fact, as soon as they have attained full size, as they contend that crops harvested under these conditions will retain their outer skins, very seldom develop roots in storage, and with curing become solid bulbs of excellent colour.



Skimmer.

Except where small areas are planted the skimmer is used to remove the crop from the soil. It consists of two blades about 30 inches long; these blades must be set perfectly level and are placed on an angle of about 60 degrees from each other, and cut on a back slope. They work parallel to the surface of the soil, and can be regulated to cut to any depth required for the removal of the onion bulb. The usual practice is to set them just deep enough to pass under the bulbs, and so shallow that they will disturb only sufficient soil to leave the bulbs in a clean row on the surface behind the machine. After the skimmer has removed the crop the onions are raked into rows with a hand rake or by an implement known as a triangle. A skimmer having two 30-inch blades will take three rows at a stroke, and on an average from 2½ to 3 acres may be skimmed in a day. It may also be utilized for weeding and cultivating.

A triangle will, at each sweep, make five skimmed rows into one, and these are then left on the ground for several days to cure, but should not be left too long lest they become dry, when the outer skin

will harden and peel off, and the market value of the crop be very materially decreased. The grower will be guided by the condition of the crop when skimmed, and the weather prevailing during the curing period as to the length of time that the crop shall remain in the rows.

When the curing process is complete a heavy set of harrows should be put over the rows on a hot day, and all loose leaves and tops removed. A fast-walking horse should be used, as the faster the horse travels the better will the work be done. This completes the harvesting operations, and the bulbs may now be graded, stripped, and bagged for market, or stored for future use.

Seed is harvested by hand into a bran bag, carried in front of the operator by means of a strap or cord passed over the shoulders. This allows the free use of the hands for cutting. The seed-heads should be cut when the seed is still firmly held in the husks. These are allowed to dry for two or three weeks, and are then ready for thrashing out with a flail, or by rolling the bags on the ground. When the seed has

Triangle.

been thoroughly thrashed out, it is cleaned by means of an ordinary farm No. 1 winnower, to which a special onion seed riddle has been fitted.

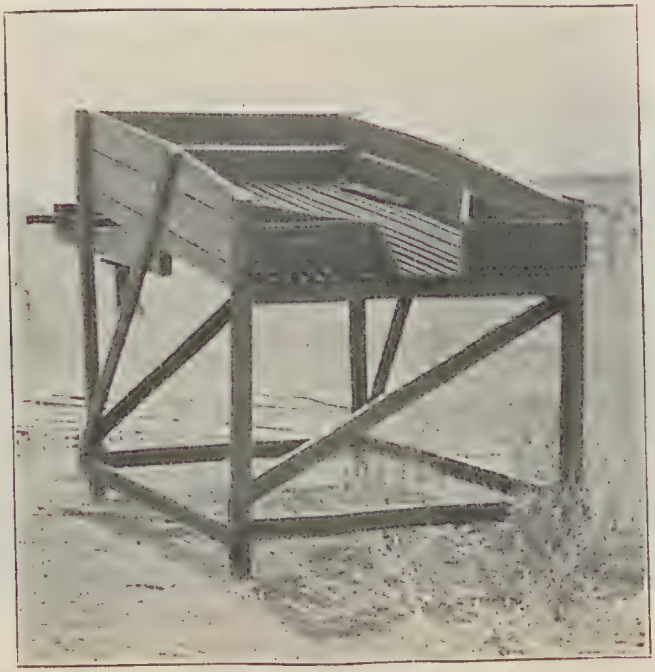
Topping, Stripping, and Grading.

In Australia the topping, stripping, and grading are all done by hand. The operator handles each onion and twists the top off close to the neck, removes all loose skins, and pulls off the long roots at the bottom. The onions are graded into two samples, known as "table" onions and "picklers." These grades are fixed by regulations under the *Fruit Act* 1917, No. 2919, and are as follow:—Table onions consist of all bulbs above 1½ inches in diameter, and picklers all bulbs of 1½ inch diameter or under.

Growers should be careful when grading to see that these regulations are complied with, as all onions are examined by an officer of the Department of Agriculture before they are placed on the market, and

no picklers are allowed to be marketed in the same containers as table onions. Thus it often happens that a grower, through careless grading at the farm, will have his consignment rejected when delivered at the railway siding or market, and he is put to the expense and trouble of re-grading the whole lot. It is better to err on the side of being a bit above the standard size than below when grading table onions.

The reverse applies to grading for "picklers," as it is then better to be a shade below the standard size, and the grower will find that it will pay to discard altogether a few pounds, or even a hundredweight, to the ton when grading than to spoil both of his samples by putting every bulb into one grade or the other. A badly-graded lot is only accepted by buyers under protest, and at a greatly reduced market value.



Screen for Grading Onions.

On page 95 is shown an illustration of an onion-topping machine used by many of the larger growers in the Connecticut Valley (U.S.A.). After the onions have been skinned and cured by drying for a few days in the field they are forked up and carted loose to the machine to be topped and stripped. The machine has a capacity for handling from 15 to 20 tons per day. The Bulletin, from which the illustration is taken, does not mention the cost of the machine, and reference is made to it here only for the information of growers who may deem it advisable to make further inquiry as to the relative cost of mechanical and hand treatment of the bulbs. The shortage of labour and high-wage cost makes it expedient for the producer in every avenue of industry to turn his mind to the use of machinery to perform many of the operations previously performed by hand, on the farm as well as in the factory.

Storage.

The bulk of the onion crop, which is harvested during January, February and March, is held over in storage by the grower for sale at periods when the market conditions appear most favorable, and the methods of storage are, as a rule, of the crudest description.

The onions having been stripped, graded, and filled into bags in the field, are carted and stacked in the bags on a few slabs or rails in the open, and a few loads of straw are then placed on top of the stack. In many cases this straw covering is again covered with a roof of

Onion Topping Machine.

Capacity from 600 to 1,000 bushels per day. The elevator which carries the topped onions into the bags is lowered to horizontal position when the machine is at work.

(Reproduced from Bulletin 169, Massachusetts (U.S.A.) Agricultural Experimental Station.)

iron or shingles, and while this is a protection against the entry of rain through the straw to the onions below they are still liable to damage owing to the sides and ends being left exposed to the weather. This exposure is necessary to allow a current of air to pass around and through the stack, otherwise the bulbs will very quickly begin to grow, or would sweat and rot. The ventilation of the stack by this means, however, defeats, to a very large extent, the object in view.

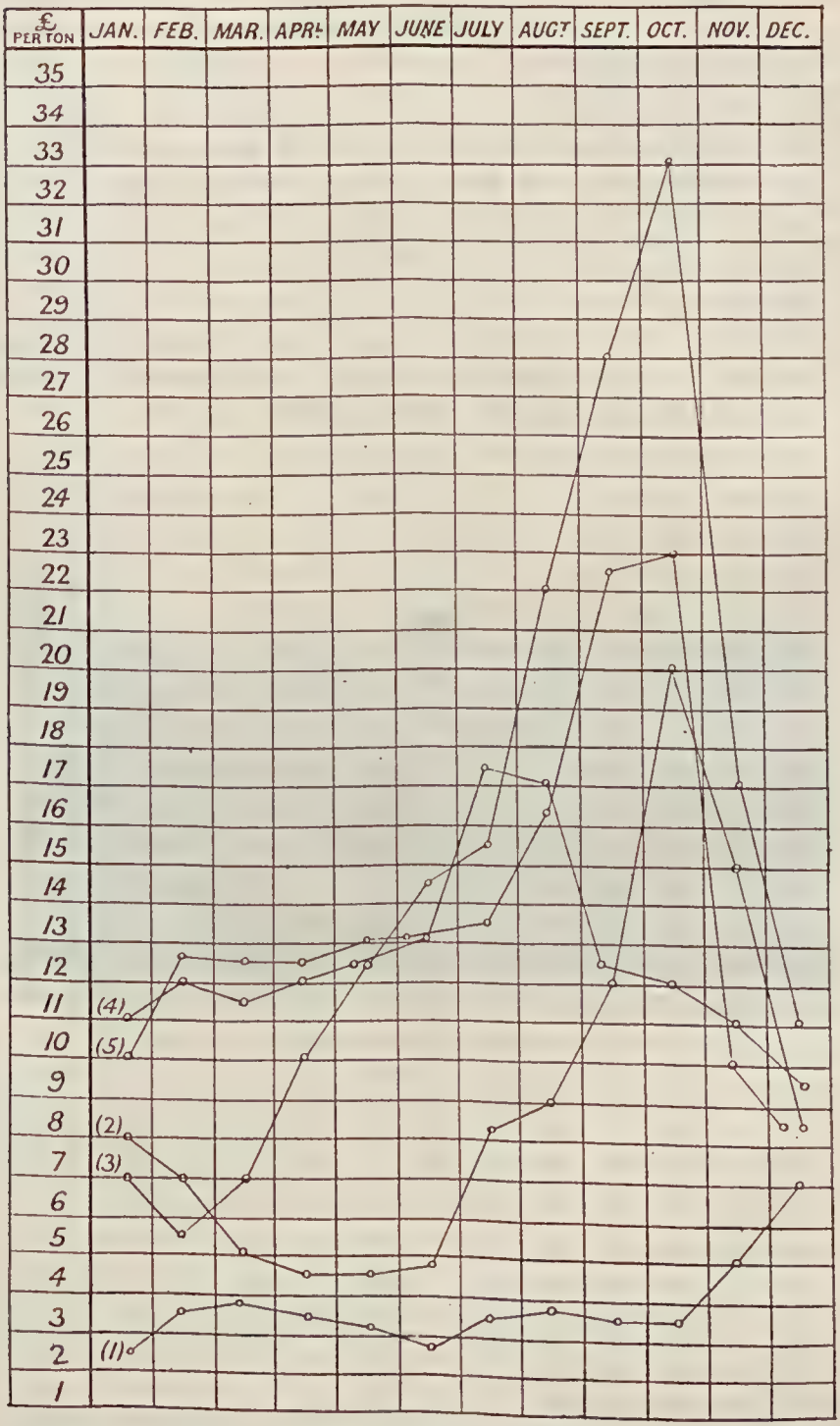
Onions should be kept in a dry, well-ventilated atmosphere, because, when exposed, as they are in the open field, they absorb a good deal

of moisture, and all too quickly begin to develop white roots and sprouts. The percentage of bulbs lost each year, through exposure, would, in a very short period, pay the cost of erecting a proper storage shed. There is also a very serious annual loss to growers through the bags, thus exposed, becoming weather-stained and rotten, and altogether unfit for the export trade, or even for transport within the State. These bags must be replaced by sound ones, and whether this is done by the grower before delivery or afterwards by the merchant the cost will ultimately, directly or indirectly, be paid by the grower.

Of late years gunny-bags, which are used for the transport and storage of onions, have been at times very difficult to procure. Yet

A Good Type of Farm Storage.
(Reproduced from Bulletin 169 of the Massachusetts Experimental Station.)

thousands of these bags have been taken from the bale new, and, through exposure and careless storage have been rendered valueless in a few months, when by care they might have been used, even for the export trade, for at least two years, for a good gunny-bag, well preserved and clean, is quite fit for export a second time. Victoria is practically the only State in the Commonwealth which grows onions for export, and these second-hand gunny-bags come back to us empty from the importing States in thousands every year, but, unfortunately, they are often fit only for local transit, and the export trade has to be met with fresh supplies of high-priced new bags, which is a further serious tax on the industry.



Average monthly value of despatch of Prime Qualities, from Spencer Street, Melbourne.

(1) 1916. (2) 1917. (3) 1918. (4) 1919. (5) 1920.

In America only onions intended for early sale are stored in bags, and the American system of storage is commended to the serious consideration of our growers. The erection of a storage shed or barn is necessary. This need not be an expensive building, but must be moisture-proof and well ventilated. When stripping and grading the onions in the field they are filled into crates instead of bags. The sides and bottom of the crate are made of slats, and each crate holds about 1 cwt. A space of about 1 inch between each slat allows free ventilation. The corners should be hardwood, not less than 3 inches by 3 inches, and raised about 1 inch above the sides. The crates may be stacked one on the other in the shed, and should be filled barely to the level of the sides, so that a space of at least 2 inches will separate the onions in the bottom crate from those in the one above, thus giving free ventilation between each row of crates. The crates may be stacked as high as convenience and the sides of the shed permit.

A Good Onion Crop (10½ tons per acre). Grown by Mr. A. Burns, Corunnun.

Experience has proved that onions stored in this way lose far less through shrinkage, and the loss through sprouting and rotting is infinitesimal when compared with what takes place under the present system of storage. A further advantage is that the grower will bag his onions only when ready to deliver, and his bags will be bright, sound, and clean, and fit for any purpose, whether required for local use or export.

If the initial cost of crates proves beyond the reach of the smaller grower, a cheaper method will be found in shelves on either side of the shed. Wire netting should be stretched tightly across each shelf to form a bottom, and battened at a height of about a foot above each shelf. The onions may be spread on the netting to a depth of 9 or 10 inches. The shelves should be built one above the other to the full height of the sides of the storage shed. This method will, however, add to the cost of handling when re-bagging. The crates will cost, approximately, about 2s. each, and, with average care, will last from twelve to fifteen years.

Marketing.

A farmer either sells his onions to the buyers and agents at his local railway siding or forwards them to agents in the larger centres of population for sale on commission. In very few instances does he come into direct contact with the consumer, the result being that the price paid by the consumer is often double that paid to the producer.

It is not the purpose of this article to propose any scheme by which the producer and consumer may be brought into closer contact, but it surely should be possible for a comprehensive co-operative system to be evolved which would preclude the present necessity of passing the produce through the hands of two, three, or more middlemen, and while giving a better return to the grower, at the same time reduce the cost very materially to the consumer.

To hold the trade under present conditions, however, is the first care of the grower. To do this he will need to put his product on the

On the Way to Market.

market in a condition that will be satisfactory to the buyer and reflect credit on the industry.

Though about five-sixths of the onions now produced in the Commonwealth are grown in Victoria, it must not be forgotten that other States are giving more attention to supplying their own requirements, and that each year the competition for the markets everywhere is becoming more keen.

It cannot be denied that complaints are all too frequent regarding the manner in which our produce is marketed. The question of grading has already been referred to, but it must be here mentioned again in respect to marketing. It is an altogether wrong idea that it is good business on the part of the grower to dispose of his entire crop at the highest price obtainable, irrespective of the quality of the onions. The growers' best interests will be served when all strive to put on the market an article of the highest quality, and in such a way as to command the admiration of buyers, whether local or oversea.

Containers.

Too little attention is paid by the grower to the question of bags for marketing his onions. His main idea is cheapness, and for the sake of saving from 2s. 6d. to 5s. per ton in the cost of bags, he frequently sacrifices from 10s. to £1 per ton on his produce. The linseed bags, so much in use during the war period, are altogether unsuitable for onions. Although they may be unbroken when delivered at the local railway siding, they are not strong enough to stand the many handlings to which they are subjected in railway and oversea transit. Onions forwarded in these very frequently arrive in bulk, even when only forwarded by rail from country sidings to the city and inland towns.

The only suitable bag is the new, or once used, gunny. It should be clean and sound, and legibly branded with the grower's name and

On the farm of Mr. G. Read, Nalangil.

address, or his registered mark, well filled but allowing for the mouth to be drawn up tightly when sewing.

The grower who takes a pride in placing his goods on the market well graded, in good bags, nicely branded and sewn, will find a ready sale for his produce at all times, even in seasons of glut and low prices, when carelessly-packed consignments are practically unsaleable.

Diseases.

Fortunately, there are very few onion diseases of a serious nature in Victoria.

Grey Mould (*Botrytis cinerea*).

This disease, commonly known as "Root rot," is by far the worst. The disease does not attack the growing plant, but under favorable conditions develops quickly in the bulbs after skimming, either in

storage or in transit. It usually attacks the bulb at the neck under the outer layers of skin; the diseased part becomes watery, quickly rots away, and becomes covered with a grey felt-like mould. This mould follows the scales down to the root where the outer skins are thinner, and there it will break out, while very frequently the neck still presents the appearance of a healthy bulb. When once the disease is well established, the bulbs rot very quickly if stored in close, damp atmosphere.

When harvesting, great care should be taken to prevent the onions becoming wet before storage. Should this happen, however, they should never be bagged or stored until an opportunity has permitted them to be thoroughly dried by being spread out thinly during a reasonably hot day. When dry, the bulbs should then be gathered as speedily as possible, and placed in cool, dry, well-ventilated storage. The grey mouldy growth on the rotted scales consists chiefly of the

Bulb affected with Grey Mould.

spores of the fungi, which are easily spread by air currents. They are thus carried to the healthy bulbs, where they germinate and send fungous threads into the necks of the bulbs, or attack them in any part where they have been wounded.

If the diseased part of the bulb is closely examined, numerous small black specks will be discovered. These small black bodies, or sclerotia, are compact masses of fungous threads, which, being resistant to drought and cold, serve to carry the organisms over winter, and lie dormant in the soil until the following season, or until they find a host plant.

When the disease is discovered in the stored onions, all affected bulbs should be removed, and either burnt or buried deeply, and all loose skins should be carefully gathered and burnt. Fields found to be productive of diseased crops should be thrown out of cultivation for onions for several years. The disease has made very rapid progress in

the older onion areas during the past few years, and unless care is exercised to control and check it, these lands must soon become valueless for the production of onions.

Onion Mildew.

Note the fungous growth on the dying lower leaves ; the two youngest leaves are still healthy.

[Reproduced from Bulletin 1060 of the United States Dept. of Agriculture.

Onion Mildew (*Perenospora schleideni*, Ung.).

This disease usually shows first as pale spots or blotches on the leaves. The spots, which occur mostly in the upper part of the leaf, gradually increase in size until they merge into one over the whole leaf and cause it to wither up. If the spots are carefully examined,

they will be found to be covered with a greyish-white powder, which later changes to a dingy violet.

In contrast to the smooth surface of the healthy leaf, the pale blotches caused by the fungus will be found to be rough to the touch, a character which serves to distinguish mildew from injury due to other agencies. It is on this roughened part of the leaf that the live spores are produced.

A second form of spore is formed on the *inside* of the decaying leaf. These provide for the re-appearance of the disease the following season, and by falling down to the ground with the dead leaves, thoroughly infect the soil. If buried, they retain their vitality for several years, but when brought to the surface they germinate, and if onions happen to be present they bring about their infection (*vide* Board of Agriculture and Fisheries Leaflet No. 178).

Like Irish Blight in the potato, damp, muggy weather conditions greatly favour the spread of the disease, but a spell of bright, dry days will check it; and should no more suitable weather occur, the crop, though attacked, may escape damage to any great extent.

Control methods are:—

1. Spraying with Bordeaux mixture (6 lbs. quicklime, 4 lbs. bluestone, 50 gallons of water) is effective; but the onion leaf, being very smooth, does not lend itself to control by spraying, as it is difficult to get the solution to adhere.
2. Dusting with the following:—Flowers of sulphur, black sulphur, or a mixture of powdered lime and sulphur (one part of lime to two of sulphur). The powder may be applied by a bellows, or sprinkled on the leaf. This should be done while the plants are wet with dew.
3. As the disease usually spreads, in the first instance, from one or more centres, it is important that the individual diseased plants should be discovered, and immediately removed and burnt.
4. As the new attack each season is due to the resting spores present in the soil, it is necessary, for the control of the disease, that all affected leaves and tops should be carefully gathered and burnt.
5. Where the disease is prevalent, onion culture should cease for at least three or four years, and the ground utilized for a rotation of other crops.

Insect Pests.

The principal insect pests attacking the onion in Victoria are Cut-worm, Thrips, Rutherglen Bug, Jassids or Canary Fly.

Cut-worms.

The Cut-worm is a brown grub about 2 inches long, which hides during the day beneath the surface of the soil or under *débris,* and

comes out at night to feed. The moth is brownish in colour, and measures about 2 inches across the wings. It usually appears about November, and successive broods are developed every few weeks until the beginning of March. The grub attacks the young onion plant at the collar (*i.e.*, just above the ground level), and eats it through, causing the young plant to fall, completely destroying it.

Treatment:—Mix 10 lbs. of bran, 4 lbs. of molasses, and 4 ozs. Paris green into a paste or dough, and divide it into small pieces about the size of a small nut, and place them amongst the crop. These are greedily eaten by the cut-worms, which are thus destroyed in large numbers. The baits are no longer acceptable to the grub once they are dry, and as they will dry up very quickly if the weather is hot, they should not be put out in the field till after sunset.

Thrips.

The Thrips are minute insects appearing as soon as the warm weather approaches. They deposit their eggs in the flowers of onions in the seed plot, and in a few days the eggs hatch, and the young Thrips commence to suck the sap from the flower, causing them to turn brown and drop off. They also attack the foliage, turning it to a silvery colour at first; later, it becomes brown, and shrivels up.

Treatment:—Deterrent spray—Benzole emulsion 1 lb., to 5 gallons of water. Phenyle spray—1 quart of phenyle, 3 lbs. washing soda, 1 bar yellow soap, 40 gallons of water. To prepare, the soap is shredded and dissolved in hot water, the other ingredients are added, and the mixture made up to 40 gallons. Tobacco-water—Steep 1 lb. of tobacco in 1 gallon of hot water, and allow to soak for 24 hours; boil 1 lb. of soap in 1 gallon of water until dissolved; strain the tobacco-water into the soap-water, stir well, and make up to 5 or 6 gallons—use waste stems of tobacco.

Rutherglen Bug.

This is one of the most destructive plant bugs appearing in the hot weather. The insects are grey in colour, somewhat resembling the ordinary fly, but much smaller. Like all plant bugs, they are furnished with a sucking beak, which they insert into the plant and extract the sap, causing them to wilt and die.

Treatment:—Same as for Thrips.

Jassids, or Canary Flies, are very small yellowish-green insects, about the size of a pin's head, appearing from September to March. They attack the plants in myriads, and cause them to wilt and die.

Treatment:—Same as for Rutherglen Bug and Thrips.

The Onion Eel-worm, which swept through practically the whole of the Portarlington onion areas some years ago, and caused a practical cessation of onion production there, has been fully dealt with in an article by Mr. W. Laidlaw, B.Sc., appearing in "Potato Diseases in Australia" (McAlpine).

Fortunately, it has not made any appearance of a serious nature in the other onion districts, and with care it should be possible to restrict it to its present areas.

TOBACCO FOR VICTORIANS.

HARVESTING BRIGHT TOBACCO.

By Max Valentine, Field Officer.

When raising a crop of tobacco the objective is to secure the greatest number of sound leaves, uniform in colour, quality, and size. The curing process is the crucial operation of the season, and every care must be taken to facilitate it. In order to obtain an even cure from each successive barn, it will be readily seen that the tobacco must all be harvested while in one condition and handled systematically. There are several essential rules which must be adhered to if this is to be accomplished. The first thing is to harvest the leaves at the right state of maturity.

As Bright tobacco ripens the leaves begin to droop, feel gummy to the touch, and the upper surface becomes slightly cockled and mottled with yellowish spots. It is then in proper condition to be harvested. If the tips of the leaves turn bright yellow and brown spots rapidly spread over the surface, it is a sign that the leaf is beginning to waste and should be dealt with immediately.

The time of this ripening period varies according to the season, but it is generally about six or eight weeks after topping. All the plants will not mature together, usually about 25 per cent. being ready at one time, which extends the harvesting over four or five weeks.

With a high-priced crop such as tobacco, all waste should be avoided. The plants should be carefully handled while being cut and hauled to the barn, care being taken not to rub or tread on the leaves. A bruised leaf will cure imperfectly. All sound leaves which fall about the field will warrant being collected.

Tobacco should not be harvested immediately after rain, as a large percentage of the gum substance, which gives the leaf quality, will have been washed out. Neither should it be handled early in the morning when dew-laden, for the same reason, and also because the plant will be brittle and because sand and dirt will adhere to the leaves.

Sufficient leaf should be harvested in one day to fill the barn, and it is essential that the fires be started in the furnaces on the same day. This point can hardly be emphasized enough, as it is a bad but common practice among growers to take two or more days to fill a barn. If this be done, the leaf which is first cut will begin to air-cure while hanging in the barn, and so be ahead of that which is cut later, making an even cure impossible. Therefore, it is advisable to have several small barns in preference to a few large ones, especially if it is doubtful whether a large gang of workers can be secured at the desired time.

There are two distinct methods of harvesting Bright tobacco which have developed as a result of the fact that all the leaves on a plant do not ripen at one time. In the one system the whole plant is harvested on the stalk when the majority of the leaves are mature, while the second system consists of priming off each leaf separately as it becomes ripe.

Both systems have their advantages, but generally the returns will be greater when priming is practised, and this method is being adopted in the most successful tobacco-raising districts.

The Single-leaf Method.

This system requires somewhat more labour in the field than the cutting method.

Each picker works down the field between two rows and plucks the ripe leaves from the plants on either hand. A low single-horse trolley or sledge, with hessian or canvas sides, sufficiently narrow to pass down the rows without breaking the plants, keeps abreast with the pickers. Each handful of leaves is placed in the conveyance with the butts all one way, to facilitate easy handling afterwards. The filled trolley is emptied in a shady spot near the barn, where further workers hang the leaves on sticks.

The standard length of these sticks is 4 feet, each carrying about fifty leaves bunched together in lots of three or four, which, looped on a fine string fastened to both ends of the stick, hang alternately on either side.

This work may be easily done by girls or boys. The loaded sticks are hung in the barn about 8 inches apart.

It has been proved that the yield of leaf harvested in this manner under normal conditions is 20 per cent. to 25 per cent. greater than when the whole plant is cut in one operation. This is largely due to the fact that a number of the unripe and small leaves at the top, which would necessarily be sacrificed were the plant cut on the stalk, are given time to further develop and mature. Also, fewer leaves will be bruised and damaged in handling. Other things being equal, primed leaves will be found heavier and of better texture than those cured on the stalk.

When tobacco harvested by the single-leaf method is being cured, the operation of drying out the heavy stalks is eliminated, thereby completing the operation some twenty-four hours earlier and offsetting the additional cost of harvesting. Furthermore, it is estimated that a barn with a capacity for curing 3 acres of cut tobacco would be able to accommodate 5 acres of primed leaf. This conservation of space also occurs in the pack-house, and further time will be saved when it comes to grading. The stalks which are left in the field, if turned under, are valuable to the soil.

The Whole-plant Method.

If it is intended to harvest under the whole-plant method, the 4-ft. hanging sticks should be distributed over the field beforehand. They should be dropped roughly end to end in every fourth row so as to provide a sufficient number for a good heavy crop.

Each cutter or pair of cutters should be accompanied by a smart boy carrying a hanging stick in a horizontal position, so that the cutter can place on it each plant as it is cut. The boy should keep abreast of the cutter, and space from eight to ten plants evenly on each stick, laying the loaded sticks in one row with the butts all one way.

The tobacco should be allowed to lie for a while in the rows until it is sufficiently wilted to permit of further handling without breakage, and then be hauled in a waggon to the barn and hung on the tiers about 8 inches apart.

For cutting, a sharp tobacco knife is used. The stalk of the plant is split from the top to within about 6 inches of the butt and then cut

off the ground. If the cutter allows his left hand to follow the knife down the cleft he will so open the ends of the stalk as to enable him to pass the plant straight on to the hanging stick with a minimum of action.

Harvesting by the whole-plant method is quicker than priming, and so can be used to advantage in the event of a late crop in a cold district, when it is necessary to house the tobacco before frosts can damage it.

A quick cutter, with a smart boy assisting, should be able to cut from 450 to 500 sticks a day.

Some growers successfully combine both methods of harvesting by priming the early lower leaves and later cutting the remainder of the plant.

Whatever system be used, it must be borne in mind that proper harvesting is half the battle in securing a good cure.

(A further article "Curing Bright Tobacco," will be published next month.)

MILK MAKES SOUND TEETH.

Dr. Percy Howe, at the head of research work in the Forsyth Dental Infirmary, Boston, Mass., where the teeth of nearly 100,000 children are examined annually and treated, states: "The mineral salts and vitamines found in milk and certain leafy vegetables are indispensable to sound teeth in children."

Dr. Howe has demonstrated this beyond question by experimental research.

Dr. Harriet Fulmer, in charge of social service work in Cook County, Illinois, reports that fully 85 per cent. of the school children have defective teeth. She states that if these children had used plenty of milk, more than 50 per cent. of them would not have had this trouble with their teeth.

Dietary scientists and food authorities state that no single food is as valuable as milk in developing and maintaining sound teeth. If these mineral salts and vitamines found in milk are not supplied to growing children in abundance—and this can be done only by the liberal use of milk—the jaw-bones, which are the framework supporting the teeth, do not develop properly and the teeth themselves protrude without proper support and are imperfect in character, irregular in shape, soft and porous, and begin early to decay.

Once this defective frame and deterioration in teeth begins, as it always does in the absence of the food elements necessary to build and maintain them, the child has started on a career of ill-health, and his future life is impaired and seriously affected.

Parents are apt not to realize the vital relationship between sound, well-placed teeth and good health. Imperfectly masticated food impairs the digestive organs, interferes with proper assimilation of food, and thus directly impairs both growth and health.

MILLET.

(Compiled by Field Branch, Department of Agriculture.)

The name "millet" is applied to a large number of cultivated annual grasses belonging to the genus *Panicum* or closely allied genera. These grasses are grown mainly as forage crops, but in Africa, India, China, and Russia they are planted extensively for their grain, which is used as a human food, either as a substitute for rice or, after being ground, as a porridge.

In this country the millets are used principally for—(1) early summer grazing; (2) green feed for stock throughout the summer; (3) to supplement the hay supply of the farm; or (4) to occupy land which would otherwise be idle on account of the failure of a regular crop, or because climatic or other conditions have prevented the seeding of such a crop. In these latter circumstances millets are, owing to their short season of growth, especially suitable.

Varieties.

The principal millets may be divided into four groups:—

1. Foxtail Millets (*Setaria italica*)—including the varieties Common, German, Italian, Hungarian, Siberian, Manchurian, Dakota, Golden Wonder, &c. The seeds of these millets are closely compacted into a club head varying a good deal in size and either cylindrical or tapering at one or both ends. The foxtail millets are of rather general adaptation as to climate and are more likely to succeed in the drier parts of the State than Japanese or Pearl millets.

2. Panicum or Broom Corn Millets (*Panicum miliaceum*)—including the varieties Russian, White French, Red French, &c. These millets are commonly known as the Broom Corn millets, since the head or panicle bears a close resemblance to Broom Corn. These varieties are the main ones used for the production of bird seed. They are also useful in the early stages for grazing, but do not make good hay.

3. Barnyard Millets (*Echinochloa frumentacea*)—the principal variety of which is the Japanese. This is a most palatable grass and readily eaten by stock at all stages up to flowering, after which it rapidly diminishes in succulence and palatability. It makes excellent hay or ensilage. Where intended for grazing purposes it should be stocked when about 6 inches high, and fed down to a height of about 3 inches. This will tend to make it stool out and become thicker. The stock should then be taken off, and if irrigation water is available it should be applied. As soon as sufficiently dry, the land should be harrowed across the drills. The stock can be put on again when the crop is 6 to 10 inches high.

4. Pearl Millets (*Pennisetum glaucum*).—This variety is known under various names, such as Penicillaria, cat-tail millet, Egyptian millet, &c. It is a tall, coarse grass and bears its seeds in a compact, slender cylindrical head or spike from 6 to 14 inches long. It is very succulent when young, but rapidly becomes woody at time of heading, so that, if intended for hay, it should be cut early. It is apparently most useful for pasturing or soiling, and on rich land furnishes several cuttings in a season. For this latter purpose it should be cut when from 3 to 4 feet high.

Climate and Soil.

Millet is adapted to a wide range of soil and climate. Although large yields are not obtained on poor soils or in dry climates, it has been found to give a heavier yield under such conditions than most other hay crops. For best results, millet must have warm weather during the growing season, and is therefore not likely to do well in high altitudes or in districts where cool weather prevails during the summer months. It naturally does best in regions which have a fairly abundant summer rainfall or where irrigation water is available. All millets thrive on a warm, open, fertile soil. Heavy land requires to be particularly well worked to produce a successful crop. Good drainage is essential if best results are to be obtained.

Millet is comparatively drought-resistant, but in this respect is inferior to Sudan grass and other sorghums. Of the millets grown in Victoria, Hungarian is probably the most drought-resistant. The Japanese millet requires much more moisture than those of the other groups, and is especially adapted to the moister parts of the State and districts where it can be grown under irrigation.

Preparation of the Seed Bed.

Owing to the small size of the seed it is essential that the preparation of the land should be such as to leave a finely-divided and well-consolidated seed bed. With light soils a rolling before seeding should be beneficial. When used as a catch crop after some early maturing crop has been harvested, it is not always expedient to go to so much trouble in preparing the land. In such case fair results may be obtained by sowing the seed on the freshly ploughed stubble. If the soil is loose and mellow, the stubble may be disced or gone over with a cultivator to kill any weeds, harrowed, and the seed sown and harrowed in.

Time of Seeding.

Because of the short season of growth there is considerable latitude as to the time of sowing. As the young plants are injured by frosts, the seed should not be sown until all danger from this source is past and the ground is warm enough to insure a good germination. Under normal conditions, in Victoria the seed may be put in from late September to January.

Seeding.

The seed may be broadcasted, sown in close drills, or in rows. Where the summer rainfall is sufficient to supply the water requirements of the crop, either of the first two methods is preferable. In drier districts, or where the crop is grown for grain, the seed should be sown in rows a sufficient distance apart (2 ft. 6 ins.—3 ft.) to allow of cultivation and consequent conservation of the soil moisture.

The amount of seed used depends on local conditions, variety of millet, and method of seeding. If broadcasted or sown in close drills, from 9 to 12 lbs. per acre of Japanese or from 15 to 20 lbs. per acre of the larger seeded varieties should be sufficient. If seeded in rows, from 1 to 4 lbs. of seed per acre, according to the variety and the distance between the rows, will suffice.

Types of Millet.

1. Japanese.
2. French.
3. Common.
4. Yellow Manchurian.
5. White Manchurian
6. Golden Wonder.
7. Pearl.

Drilling in rows may be done by means of the ordinary drill, a sufficient number of the hoes being blocked up to give rows the requisite distance apart. The seed may also be sown with the Planet Junior drill, or a maize planter with special plates for the smaller seed. Owing to the smallness of the seed, it is important that it should not be sown too deep. If sown deeper than 1 inch a poor germination will probably result.

Fertilizers.

Millets are shallow rooted and therefore draw their nourishment largely from the surface soil. For this reason the supply of plant food should be concentrated in the upper layers of the soil and should be in a form readily available to the plant. Well rotted farmyard manure, if available in sufficient quantity, is particularly beneficial. It should be spread over the land before ploughing and turned in. Where farmyard manure is not available, liberal dressings of artificial fertilizers will be found profitable. In the drier districts a dressing of 1 cwt. of super. per acre will be sufficient. In the more humid areas a mixture of super. and Thomas' phosphate has proved good, while in certain districts nitrogenous manures may prove profitable.

Pasturing.

Millet serves admirably to supplement the pasturage during the summer and early autumn months. Provided it is not grazed too close, it will tiller better and sprout more freely after being pastured down. The paddock should be stocked when the millet is from 6 to 8 inches high, fed off to 3 or 4 inches, and the stock then removed till the second growth has reached a similar height. With careful treatment it can be kept growing throughout the summer and will provide a considerable amount of excellent feed. When cattle are pastured on millet the usual precautions should be taken to prevent injury by "bloating." They should not be turned on to the crop while hungry, and, at first, for not more than half an hour at a time.

Soiling.

For the purpose of providing green fodder for dairy cattle millet is especially adapted, the most suitable variety being Pearl or Egyptian millet. It yields a large amount of forage per acre, and, under favorable conditions, gives two or three cuts in a season. It is most succulent when young, and gives the best fodder if cut when from 3 to 4 feet high. Japanese millet is also suitable for soiling, and for this purpose may be cut as soon as the grass heads out, or even earlier.

Hay.

When required for hay, millet should be cut about the time most of the heads have appeared. The feeding value of the hay is probably greatest from this time until the seed reaches the milk stage. The hay may be cut with the ordinary binder, working about 3 inches from the ground. If cut closer, the plants may be injured, and consequently the second growth will be affected. The sheaves should be small and loosely tied to allow the leaves to cure readily. They should be stooked in rows, and when thoroughly cured stacked in the ordinary way.

Ensilage.

Millet has been employed for ensilage with satisfactory results. For this purpose the crop may be cut any time between heading out and the formation of the seed; preferably when most of the plants are in late bloom.

Seed.

Where the seed is required the crop should be allowed to mature before cutting. At the same time care must be taken that it is not allowed to stand until it is over ripe, or a considerable amount of seed will be lost by shedding. The crop may be cut with the grain binder, and the sheaves placed in long, narrow stooks. It is then allowed to stand in the paddock until the grain can easily be rubbed out in the hand. Threshing is done with the ordinary grain thresher, the screens being replaced by ones capable of handling the smaller seeds.

Feeding.

It has been found that when fed as sole roughage to horses, millet has a very injurious effect. Its continuous use is followed by increased action of the kidneys, general debility, a softening of the bones, and inability to stand. However, when fed sparingly, in conjunction with some other roughage and always with some concentrate, millet hay should prove satisfactory and produce no unfavorable effects.

CRYSTALLIZED, CANDIED, AND GLAZED FRUITS FOR HOME USE.

(*By Miss A. Knight, Fruit Preserving Expert.*)

Almost any variety of fruit may be preserved by these methods, but those generally favored are cherries, apricots, plums, pears, small oranges, kumquats, pineapple, and to a lesser extent quinces, melon, peaches, and gooseberries.

If a considerable quantity of fruit is to be treated it will be necessary to provide several fair-sized jars, wooden tubs, or other suitable receptacles in which to allow the different batches of fruit to steep in the various syrups. A saccharimeter or float gauge for testing the density of syrups would be found an advantage.

Fruits should be allowed to become slowly saturated with the sugar solution. To accomplish this, it is necessary to steep them for the desired length of time (according to variety) in syrups of varying densities, the required strength of which should be maintained throughout the process. Some varieties give a better result if they are first steeped in a medium syrup, the density of which should be gradually increased. Others must be cooked first, and afterwards put direct into a heavy syrup. It is essential that fermentation should be avoided during the steeping process.

Crystallizing.

The fruit, after being removed from the last immersion syrup as described, is partially dried off in a warm room, and then placed in the crystal. The crystal syrup is prepared by dissolving a good coarse-grained sugar in just sufficient water to melt it, about 6 lbs. sugar being allowed to each quart of water. The sugar should be dissolved before boiling heat is reached, and any scum removed. Test as soon as it boils; a degree of 220 deg. F. to 222 deg. F. is required; when this is registered, draw the pan aside, and allow the syrup to remain undisturbed until it has cooled off to about 98 deg. F. The fruit to be crystallized is then placed in crystal pans or suitable dishes selected for the purpose, covered with the crystal and allowed to remain in a moderately warm room for from 8 to 10 hours, or until sufficient crystallization has taken place. It is essential that the syrups be not agitated or disturbed during this process. When sufficiently coated, the syrup should be very slowly drained off; this may be done either by tilting the pans slightly, or by removing a plug from below. After draining slowly for some hours the fruit may be carefully removed, and placed on wire trays in a suitable place to dry. It should then have a good appearance and be covered with crystals.

To Candy the Fruit.

Make a syrup as above described, boiling it to a degree of 232 deg. F.; put a sieve-full of the prepared fruit into it, and with a wooden paddle stir slowly on the side of the pan, and, as soon as the syrup forms a fine grain, remove the fruit, putting it to drain and to set, and separating the pieces to prevent them sticking together.

Glazed Fruit.

To glaze the fruit, make a syrup, using 4 lbs. sugar, 1½ pints water, ½ teaspoon cream of tartar, and boil it to a degree of 300 deg. F. Dip the prepared fruit, and place it on a greased slab or large meat platter until set. Fruits treated in this way should have a clear, glossy surface.

Apricots.

Select first-grade fruit of a nice size and colour, but rather under than over ripe; partially open the apricots and remove the stone, this may be done either by making an incision in the stem end of the fruit and carefully pushing the stone through with a cooking needle, or the apricots may be cut open sufficient to allow the stone to be extracted. The fruit is then blanched in water or steam for a few minutes (care being taken not to soften the flesh too much), then dipped in cold water, and when drained are ready to be steeped in the various syrups. The first solution may be made by boiling together 4 lbs. sugar to each gallon of water for five minutes. The liquid should be cooled off to a temperature of about 170 deg. F. before the fruit is immersed. Very careful handling is required at this stage as the natural shape of the fruit should be retained as much as possible. During the saturation period all fruits should be well covered with syrup and not allowed to

float. After remaining two or three days, the syrup will have become weaker, as the fruit gradually absorbs the sugar. The syrup then requires to be strengthened—by adding more sugar and reboiling—on the second occasion to 218 deg. F. When cool, pour the liquid over the fruit again and allow it to remain as before for five or six days; then repeat the operation on two or three occasions, or even more if needed, to give the fruit a fine, clear, transparent, rich appearance. The last solution in which it is steeped may be boiled to a degree of 218 deg. to 220 deg. F., and if desired the fruit may be allowed to remain in this for an indefinite period, or may be finished off and packed away.

There are several ways of finishing off, and any may be adopted—crystallizing, candying, or glazing—while some prefer the simpler method of rolling the prepared fruits in sugar. The latter method makes a fairly good article, though, of course, not one so presentable as that which is crystallized.

Cherries.

Bright-coloured cherries should be selected for this purpose, and should be stoned as carefully as possible so as to avoid tearing unnecessarily the flesh of the fruit. They are blanched in boiling water for a few moments, drained, and immersed in the various syrups (finishing strength about 220 deg.) and allowed to remain until well permeated with the syrup. Cherries are sometimes artificially coloured by adding the desired colouring agent to the steeping syrups. When ready to be finished off they are drained, partially dried, and dealt with in same manner as described for apricots.

Pears.

Both the Bartlett pear and the winter variety may be crystallized. When using the latter the fruit should be peeled and the stems left. The pears should then be gently boiled in the various syrups in which they are steeped, until the red colour is gained. When the ripe pears are being treated, they are peeled, blanched, cold-dipped, and then covered with the syrup, which should be boiled to a degree of 218 deg. to 222 deg. F., and left until sufficiently preserved. The fruit should be drained every few days and the solution re-strengthened, so as to keep it to the standard. Afterwards pears may be treated in very much the same way as apricots. The steeping syrup for pears may be flavoured with ginger or such other flavour as is desired.

Green Gages.

These are usually done whole, and treated in a similar manner to apricots. The steeping syrups should be boiled from 215 deg. to 220 deg. F., and cooled off to about 170 deg. F. before pouring over the fruit. To finish, they may be crystallized, candied, or sugarded, and look well when treated by any of these processes.

Small Green Oranges.

Very small oranges should be selected. They should be first soaked in brine for a few days and then boiled in fresh water to which a little carbonate of soda has been added. Cook for about twenty minutes, and then cover them with a syrup heated to 218 deg. F., and leave them in this for a few days. Then increase the strength of the syrup by heating to about 225 deg. F., and allow the fruit to remain in this for a week or so, then dry off and crystallize or sugar as desired.

Figs.

Select the figs before they are fully ripe and simmer them for about half-an-hour in the syrup which has been heated to 217 deg. F. and flavoured with ginger. Allow the figs to steep for one or two days, and repeat the operation as with other fruits. The last syrup should be heated to 222 deg. F. Dry them off and crystallize or sugar, as desired.

Gooseberries.

Deep-red fruit may be topped and tailed, and afterwards treated in a similar manner to apricots, except that they should not be blanched. When dried off they may be glazed, as already described, in a syrup boiled to 300 deg. F.

Quinces.

They should be cut into sections and treated in the same way as winter pears.

Peaches.

Peaches should be peeled, pitted, and cut into desired sizes, and then treated in a similar manner to apricots.

Melon.

The firm part of the melon is cut into even-sized blocks or sections, steeped in water for thirty-six hours, and then boiled in that water until clear. The steeping syrups may be flavoured with ginger, which greatly improves the product; and if wished, they may be coloured. They should be brought to a heat of from 220 deg. to 230 deg. F., and poured over the melon whilst hot. After the melon has been steeped for eight or nine days it may be brought to boiling heat in sugar solution and again allowed to cool. When desired it may be dried off and either crystallized or candied; either method makes a good article for home use.

Pineapple.

Pineapple may be cut into blocks, triangular pieces, or in full slices with the core removed. After the necessary preparation the fruit may be blanched, or partially cooked in boiling water, then removed with a perforated skimmer and put to drain. A steeping syrup is heated to about 215 deg. F., and poured over the fruit. This operation may be repeated three or four times; the last syrup should be heated to 230 deg. F. The syrup does not need to be cooled off before it is poured over the pineapple. The fruit is then ready to be candied in a syrup boiled to 232 deg. F., and slightly grained as before described. At this stage it is also ready for use in a milk chocolate dip.

Apricot and Other Fruit Pulp.

Prepared fruit pulp may also be crystallized, rolled in sugar, or coated a good fondant cream, or with milk chocolate. First of all the pulp must be passed through a sieve. Meanwhile dissolve the sugar by boiling it as before directed to 254 deg. F. Allow about half the weight of sugar to that of pulp and only just sufficient water to dissolve the sugar. Mix the pulp with the boiling syrup and cook until the mixture is fairly thick. This may be spread in layers of a thickness of one-eighth of an inch on oiled platters and dried until it is stiff enough to be cut into shapes; it may then be sugared, or crystallized, or finished as may be desired.

It is sometimes an advantage to add a trace of tartaric acid to certain fruit pastes of this kind, so as to develop or make the fruit flavour more pronounced; this is added to the batch just before removing from the fire.

Peaches, quinces, figs, apples, guavas, plums, damsons, strawberries, black currants and logan and raspberries are all suitable for treatment in this way; the fruit should be selected ripe for the purpose.

Candied Lemon and Orange Peel.

Select clean-skinned fruit. Cut them in halves and remove the pulp, the juice from which may be used for other purposes.

Soak the peel in brine for not less than three or four days, though, if desired, it may be left for a much longer period. Then drain and wash, and boil gently in fresh, clean water until the peel is three-parts cooked. Then place it on a large sieve to drain. Meanwhile make a syrup of 4 lbs. sugar to 1 quart of water, which should be heated to 215 deg. F. Put the well-drained peel into this and simmer for five minutes. Then allow to cool in the syrup and steep from seven to ten days, or longer if desired, during which time it should assume a rich colour and an almost transparent appearance.

The peel should then be removed and partially dried, and when reasonably firm immersed in a finishing syrup (boiled to 232 deg. F.), and stirred until a slight grain forms, when it should be removed at once and placed to drain and set. The peel may, if desired, be allowed to remain in the first syrup until required. This saves the task of drying it off and finally coating it. This is sometimes a more economical method of storing, and the peel is just as serviceable for general use, though, of course, it is not so suitable for counter trade.

EGYPTIAN INCUBATION.*

By Capt. W. H. Cadman, B.Sc., A.I.C., Head of the Department of Agricultural Physics, Higher School of Agriculture, Giza, Egypt.

Origin and Inaccurate Descriptions of Egyptian Incubators.

The origin of Egyptian incubators is very remote, and probably dates from about 3000 B.C. Very little has been written about them, and inaccuracies are common in most of the descriptions hitherto published. The reasons for this are:—(1) The profession is an hereditary pursuit and is confined to particular families. It is handed down with plighted word from father to son. (2) The secrets are jealously guarded by the expert operators, who are trained at two towns only, Birma in Lower Egypt, and Bilbau in Upper Egypt, and (3) travellers visiting the incubators are regarded with suspicion, and even Native Government Inspectors are given false returns for fear of increased taxation.

The Buildings.

The Incubator is called in Arabic "Maamal el Ferakh," or "Maamal el Katakeet," meaning a factory of poultry or of chickens. Externally, the building is exactly like an ordinary native residential house, with the exception of the roof, which has a number of dome-shaped openings which, however, are not seen from the village streets. Sun-dried Nile-mud bricks are used in its construction, as for all old native houses in Egypt. The walls are very thick and the material used is a very bad conductor for heat. If the building stands alone away from other houses, the outer brick walls are invariably double, of about 1 foot in thickness. The space between is about one yard in thickness, and is filled with loose sand or fine earth mixed with chopped straw. I visited a small but typical incubator this year at Birma, near Tanta. The main entrance leads into a few rooms, some of which are used as living rooms for the owner and his expert operators, while others are used as storage rooms for eggs, fuel, &c. A small door leads from one of these rooms into a central passage of the Incubator proper. This is divided up by low ridges into a number of pens for the newly-hatched chicks. The roof is dome-shaped and has several small openings for light and ventilation. On either side of this central passage are the egg ovens, which vary in number from 6 to 26. Each oven is two-storied and each compartment has a small entrance from the passage, just big enough for a man to crawl through. These openings can be closed at will by means of sacks filled with flax-tow, or matting.

The upper and lower compartments are connected by an opening in the floor of the upper one, through which the operator can pass. Along both sides of this square upper floor and parallel with the central passage are shallow troughs, often lined nowadays with metal obtained from empty petrol tins. These troughs are about 8 inches wide and are used for the glowing fuel. One has to carefully avoid stepping on these tin-bottomed shallow troughs when crawling into the upper cell. The roof of the upper compartment is dome-shaped and has a central

* Reprinted from the *Utility Poultry Journal*, England.

hole for the escape of smoke, &c. The floor of the lower compartment is simply the earth compressed by use.

Method of Working.

Incubation only takes place for about four months of the year during the cold weather. Fleas and other insect pests peculiar to hot climates are left undisturbed during the remainder of the year. To destroy these pests and at the same time thoroughly disinfect the buildings before use, large fires are lighted inside the central corridor and in all the egg ovens. The fuel for this purpose consists of a mixture of dung and chopped bean straw. This preliminary heating is continued for a few days with the external openings mostly closed, while the eggs are being collected. All cracked or thin-shelled eggs are detected by tapping with the finger nails, and are rejected. By regulating the size of the roof openings, the ovens are next cooled down to the right temperature for introducing the eggs. *No thermometers are used.* Long experience enables the expert operator to know the required temperature by his sensation alone. All the fires are now discontinued, except those in the fuel troughs of the upper compartment. These are kept burning for the next ten days. Chopped bean straw alone is now used as fuel.

Each oven holds from 7,000 to 8,000 eggs at a time, but all the ovens are not filled the same day, so as to facilitate the working, and also to avoid having too many chicks hatched at the same time. An interval of from two to three days elapses between the filling of one oven and the next. Thus each oven is only used for four or five clutches during the season.

Before inserting the eggs, the floor of the lower compartment is covered with a rush mat sprinkled with bran. All the eggs are at first put on this in six heaps. The opening leading to the central passage is then closed, and this lower compartment is entered during the subsequent operations from the upper one through the hole in the floor, which can also be closed easily. Two of the six heaps of eggs are spread out directly beneath the fuel troughs, so that they are heated from above as with the sitting hen. The fuel only needs to be renewed twice daily, as the glowing bean straw burns quite slowly. The eggs are moved at intervals of about eight hours by simply pushing them round in rotation with the arms, those spread out being collected into a heap and the next heaps being spread out under the troughs in their turn. Each egg is thus frequently displaced, but no care is taken to turn each egg over as is recommended for many modern incubators. The temperature is noted from time to time by the operator or his assistants, who simply place an egg against the sensitive skin of the eyelid. The heat is controlled by regulating the roof openings, and the amount of glowing fuel. No water of any kind is introduced into the building throughout the whole period of incubation.

During the time the fires are burning there is a considerable amount of smoke and smell inside the egg ovens. On the seventh day each egg is examined by holding between the eye and a small olive oil lamp, or a beam of sunlight, and the clear unfertile eggs are removed and sold in the markets. After ten days all the fires are put out and the smoke quickly escapes. From now onwards the eggs are moved twice daily.

All ashes are removed from the troughs and mats are spread on the floor of the upper compartment. Half the eggs are transferred from the lower to the upper floor on the thirteenth day, and all the eggs are now spread out over the two floors.

The opening from the upper chamber to the central passage is now closed to maintain a more constant temperature for the eggs. As no fires are used from the eleventh day, it is evident that the heat necessary to maintain the required temperature for the remainder of the time is evolved from the development of the chicks within the eggs. Nearly all the chicks appear on the twenty-first day as with natural incubation. These are collected and thrown in armfuls into the pens of the central passage, and the following day are disposed of as day-old chicks. The custom of selling chicks by measure (as used for measuring corn or beans) is still practised at some incubators, but they are more generally counted.

Very few cripples or dead-in-shell are met with. Any such are thrown to the village dogs.

Statistics.

In 1911, at my suggestion, the Egyptian Government had the first census taken of incubating establishments throughout the country, when 512 were found to be working. The last census returns are for the season 1915-16, which shows 570 buildings, with a capacity of over 21,000,000 eggs at one time, of which 553 were working.

About 15 per cent. of the eggs are removed as unfertile or broken, and of the remaining eggs an average of from 80-85 per cent. hatch successfully for all the incubators of the country. The most expert of the operators often reach 90 per cent., and over. I have never, during seventeen years' experience of these incubators in all parts of the country, heard or come across a case of a complete failure. If this did happen, it would be a serious loss with so many eggs at stake.

Research.

To determine the conditions within the egg ovens during the period of incubation, I introduced self-recording instruments where possible. The results show a fluctuation of temperature within the lower compartment and beneath the fuel troughs of from 35 deg. to 40 deg. C. (95 deg.--104 deg. F.) during the first ten days, with a nearly constant temperature of 38 deg. C. (100.4 deg. F.) for the remainder of the period. The average temperature outside the building at the same time was 15 deg. C. (59 deg. F.) with an average daily range of temperature of about 12 deg. C. (21.6 deg. F.) between the hottest and coldest parts of a day and night.

The average temperature of a sitting of eggs placed under a turkey during the same period was 39 deg. C. (102.2 deg. F.)

The relative humidity during the first ten days varied from 38 to 50 per cent., after which it increased to 68 per cent., and then fell to 45 per cent. on the thirteenth day, and again rose to 70 per cent. on the fifteenth day. It then gradually fell to 45 per cent. on the twenty-first day; the mean relative humidity for the period of incubation being about 50 per cent. against 71 per cent. outside the building.

The mean daily relative humidity at Cairo is about 75 per cent. during the winter, and 60 per cent. during the summer. The humidity at Marg, where the incubator examined was situated, is reduced by proximity to the desert.

The products of combustion from the burning fuel and from the olive oil lamps used for illumination and egg testing inside the ovens, together with the products of respiration from the attendants and from the developing chicks, all tend to make the composition of the air within the incubators very different from that of the outside air. By means of a Dr. Haldane's portable carbon-dioxide testing apparatus (such as is used in coal mines) the average amount of carbon-acid gas per 10,000 volumes of air inside the egg ovens was measured throughout the period of incubation.

For the first ten days the average was about 15 parts by volume in 10,000, with a range of from 10 to 25. The amount then increased until the thirteenth day, when it reached a maximum of 48. It now fell gradually to 15 on the last day of incubation. The mean for the whole period of incubation being about 25 parts against about 3 parts in 10,000 outside the building, and a mean of about 12 parts in 10,000 under a broody hen sitting on eggs. A comparison of this curve with the relative humidity curve shows clearly a marked change taking place (1) from the tenth day, and (2) from the thirteenth day, which have long been recognised by the illiterate operators as critical periods in the development of the chicks.

Conclusion.

It is certain, therefore, that in natural incubation as well as in the artificial incubators in Egypt and China, the air surrounding the eggs contains a much larger proportion of carbonic acid gas than atmospheric air. How is it that this proportion of carbonic-acid gas is not as injurious to the development of the chick as it would be to human beings? The Egyptian operators and their assistants are always pale and thin from breathing this foul air and do not appear to live as long as their neighbours who are otherwise employed. Is the natural explanation that suggests itself satisfactory and sufficient, viz., that the embryo in the egg requires a certain amount of this gas for its optimum development? Physiologists have already proved that carbonic-acid gas is indispensable to the evolution of fœtal life in certain animals and man, then why not in chicks also? The introduction of carbon-dioxide by artificial means into modern incubators has so far given excellent results when compared with control experiments in which this was not done. Not only was the percentage hatch greater, but the chicks were stronger and the dead-in-shell were very much reduced.

Further experiments must be made, however, to prove or disprove this deduction.

Additional Note.

It is rare to find a native hen broody in Egypt. The instinct to sit appears to have been lost through the extensive use of Egyptian incubators.

EXPERIMENTS IN THE COOL STORAGE OF CITRUS FRUITS.

Report by Exports Superintendent (Mr. R. Crowe).

The first experiment in storing citrus was made in 1904. On the 30th November of that year 250 cases of oranges and lemons were placed in the Government Cool Store, Flinders-street. They remained there till the 21st December, when they were taken out in good condition. The short period they were left in storage was due to the favorable market just before Christmas.

In 1905 over 1,000 cases were stored in the Government Cool Store at Doncaster, where they were left for periods varying from four to six weeks; the markets then being favorable they were disposed of. At the time the fruit was delivered from the Store its condition was such that it could have been kept in cool storage for a much longer period.

In 1907 a total shipment of 1,600 bushel cases of "Washington Navels," "Late Valencia," and "St. Michael" varieties was sent from Victoria to London. The fruit was landed in good order, and realized from 12s. 6d. to 16s. per bushel.

During 1910, 2,000 cases of citrus were put in the Government Cool Store at Doncaster, and after being stored there for periods varying from two to three months, were delivered in good commercial condition.

On 19th July, 1915, 18 varieties of oranges were placed in the Government Cool Stores, Victoria Dock, and upon inspection on 30th September (76 days afterwards) were found to be in good condition. The varieties giving the best results were:—

"St. Michael,"
"Common,"
"Late Mildura Seedlings,"
"Australian Navel,"
"Queen Orange,"
"Late Valencia."

The next best were—
"Maltese Blood,"
"Azorian,"
"Wolf's Skin Seedlings,"
*"Emperor Mandarin,"
"Seville."

The third best keepers were—
"Ruby Blood,"
"Canton."

After which came—
"Egg-shaped,"
"Parramatta,"
"Poor Man's Orange."
Then "Siletto"; and, finally, "Mediterranean Sweet."

* "Emperor Mandarin" had reached the limit for keeping, and, although still good, they would not bear the handling and marketing.

Only one case of each was included in the above experiment.

Five varieties of lemons were also stored for the same period as the oranges above-mentioned. The best keepers proving to be "Eureka" and "Wild"; next to which came "Chinese"; then "Lisbon," and finally, "Densey".

Recent experiments were made with 361 cases of oranges obtained from various growers in the Tresco and Nyah irrigation districts. They were placed in cold storage on 27th July last, and were examined on the 4th October—after a storage period of nine weeks and six days.

The temperature of the fruit when picked averaged 65 degrees Fahr., and on arrival at the Government Cool Stores averaged 68.5 degrees. The temperature of the chamber during the experiment averaged 36 degrees by the dry thermometer and 35 degrees by the wet bulb thermometer—equal to 90 degrees humidity.

The results showed that there was less loss in the wrapped fruit than the unwrapped, either in lined or unlined cases, as of 112 cases wrapped, 6 were lost by disease and 10 through loose packing; a total of 16, equalling 14.29 per cent. Of the naked fruit (116 cases) 7 were lost owing to disease and 14½ as the result of loose packing—a total of 21½ cases, equalling 18.53 per cent. And, of the fruit in the lined (133 cases) 14 were lost through disease, and 16½ by loose packing; a total of 30½ cases, equalling 22.92 per cent.

The methods of packing (diagonal or square) and kinds of cases used (hardwood or softwood) appear to have had little or no effect on the results, and it would appear that lining the cases is not so effectual in preventing loss as the wrapping of the individual fruit.

When the fruit was re-packed for sale, there was a total loss of 68 cases—equal to 18.83 per cent. The loss was not actually as heavy as the figures indicate. A portion may be accounted for by the cases reaching the stores loosely packed, and, when ultimately re-packed, the fruit naturally went into smaller space.

The losses could have been materially reduced by more careful picking, handling and packing, and the wrapping of the fruit individually.

The value of the 361 cases when originally put into the Store was estimated at 6s. per case, or £108 6s. The 293 re-packed cases averaged in the market 13s. 10½d., or £203 5s. 4d.

Storage at 1¼d. per case for ten weeks would have amounted to £18 1s.; therefore, the net gain was £76 18s. 4d., after allowing for losses and cool store charges.

Three thousand one hundred and seventy-one cases of oranges were placed in the Government Cool Stores, Victoria Dock, during the period from 10th to 31st August, 1921, and were marketed up to 25th October in good condition.

OATS AS A FOOD FOR PIGS.

Although, as a rule, oats are preferably fed to horses, cattle, or sheep, I see no good reason why they should not be fed with advantage to pigs when other avenues are closed, says the Director of Agriculture (Professor Arthur J. Perkins). As to whether this can be done profitably or not will depend, of course, on the current market value of oats, and on the price that can be realized for pigs fed on them. Feeding pigs on oats alone is hardly to be recommended, except, perhaps, when fattening-off old sows. For younger pigs, particularly for growing ones, some more highly nitrogenous foodstuffs should be associated with oats. If grazing, particularly leguminous grazing (lucerne, clovers, &c.), is available, no addition will be needed. I suggest the following oat ration for pigs of various ages and sizes:—

For Young Growing Pigs, 40 lbs. to 80 lbs. in Weight.—If oats alone are fed, daily requirements would be represented by 2½ lbs. to 5 lbs. according to sizes. The oats should either be crushed or soaked over night in no more hot water than they would absorb. They should be given, preferably, in three meals. The above figures presuppose the oats to be first quality; if inferior, quantities may have to be increased.

The following, however, represent far better rations for young pigs and are recommended:—

	40-lb. Pig.	80-lb. Pig.
Ration 1—		
Crushed oats	2 lbs.	4 lbs.
Skim milk	2½ lbs.	5 lbs.
Ration 2—		
Crushed oats	2 lbs.	4 lbs.
Abattoir's pig meal	¼ lb.	½ lb.

For Fattening Pigs, 120 lbs. to 160 lbs.—Again, if oats alone were fed, daily requirements according to size would be 6 lbs. to 8 lbs. with sufficiency of green feed if available. But there is nothing to be gained in stinting fattening animals; the main object in view is to fatten them off as rapidly as possible. They must absorb a definite amount of food to reach market condition, and it is more economical that this food should be consumed in a short, rather than in a long period of time. Waste, however, should naturally be avoided and animals fed according to their appetites and ability to clean up their feed-boxes.

In preference to oats alone, and in the absence of other available material, the following rations may be recommended:—

	120-pounder.	160-pounder.
Ration 1—		
Oats	5 lbs.	7 lbs.
Skim milk	5½ lbs.	8 lbs.
Ration 2—		
Oats	5 lbs.	7 lbs.
Abattoir's pig meal	½ lb.	¾ lb.

Journal of Agriculture of South Australia, December, 1921.

WHEAT-GROWING.

Assuming the adoption of up-to-date methods of cultivation, it is estimated that Australia's potential wheat-growing country covers an area of between 200,000,000 and 300,000,000 acres. It is unnecessary, perhaps, to go beyond those figures for the present. It is important in passing, however, to point out that experts are loth to delimit the possible acreage. Within the last fifteen years agricultural science has opened the way to such an enormous extension of the cultivated area that it is unwise to conjecture as to the future developments. Australia is now developing varieties of wheat for light rainfall localities, and has evolved cultural processes for the conservation of moisture which suggests the probability of the frontier of cultivation being pushed still farther inland. Accepting even 200,000,000 acres as the area of the proven safe wheat-growing territory, there is room to-day for twenty-fold expansion of the cultivation country. In 1915 Australia sowed 12,000,000 acres under wheat. This is her maximum attainment so far as area is concerned. The year 1915 also marked the highest average yield per acre. In that year 14 bushels per acre were obtained, although the average annual production is just short of 10 bushels per acre.

Australia's reputation as a wheat-growing country has suffered, strangely enough, by the very richness of the soil and the kindliness of the climate. Growers have adopted speculative methods on the chance of big harvests. They have aimed at great acreages instead of at good cultivation. The disparity in the returns obtained by the indifferent farmer and the good farmer is amazing. Many growers, although unfortunately far too few, average year in and year out at least 20 bushels per acre. They enjoy no natural advantage over their neighbours, who, perhaps, average only 8 bushels per acre; but they cultivate their land instead of merely scratching its surface.

In no country in the world are the prospects of the wheat-grower brighter than in Australia. The average yield may be at present comparatively low; but the cost of production per bushel is relatively lower. It is in the low cost of production that the Australian has the advantage. Land values, although they have risen considerably during recent years, still remain at a fairly low level. Wheat country is obtainable at from £2 to £10 per acre. Big teams and big implements reduce the cost of cultivation to a minimum. One man can put in and take off about 200 acres of crop unaided. The small farmer, therefore, employs little or no labour during the year.

The majority of the Australian farmers began as labourers, and have had no scientific training. They earned good wages, saved hard, and eventually obtained land on easy terms. The way is still open to the present generation to do the same.—[From an article entitled, "The Empty Continent," written by Lord Northcliffe.]

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Young Trees.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

Fumigation.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, if the foliage of the trees be thoroughly dry.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

Horses.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

Cattle.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the droppings, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available. It will pay well to feed crushed oats to good cows.

Pigs.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now. Pollard should be used for very young pigs, and bran for suckling sows, and to help to prevent constipation.

Sheep.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks for ewes with early-born lambs. Where possible, castrate ram lambs immediately. Fair prices will be available this winter, particularly for lamb.

Poultry.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

BEE-KEEPING.

Since the end of November the season has been quite abnormal from the bee-keepers' point of view. Owing to frequent cold changes and southerly winds but little surplus honey has been stored from Yellow and Red Box, even in favoured localities, so that the total yield will be far short of what was expected.

Grey box, which is considered to be our most dependable honey tree, is showing very little bud, and the flowering will apparently be late in some districts—too late to be of any use to bees, unless we have an exceptionally warm autumn.

During February bees commence to arrange their stores of honey and pollen in preparation for the coming winter, and it is therefore unwise to interfere with the combs in the brood chamber, to insert empty combs between the brood, or to change the position of the combs.

Where there is a surplus of honey in the upper story, it is best not to take the whole of it in one operation, but to take half, and when the emptied combs are filling up again take what was left. At this time of year bees will work better and keep on breeding longer with a full, or partly filled, super than with empty combs above the cluster of bees.

When there is a shortage of honey in February or March, it is best to give only enough sugar syrup to carry the bees through till April, but to give whatever amount is necessary in the shortest possible time. Feeding extending over many days will stimulate brood-rearing, and a few weeks later the bees will be short of food again, compelling further feeding.

In the case of colonies below the normal strength in the number of bees, continuous light feeding will do no harm; it will, on the contrary, be beneficial, as it increases the number of young bees, but the feeding for winter stores should be deferred till the middle of April, when but little of it will be used for brood rearing.

CULTIVATION.

Farm.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

Orchard.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

Vegetable Garden.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

Flower Garden.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

Vineyard.—Select scions, if not done last month. In cooler districts, where ripening is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price 6s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

NATIONAL MUSEUM MELB

RAPE The Food for Sheep

SOW NOW FOR QUICK GREEN FEED

A Field of Giant Kangaroo Rape

RAPE is a profitable Winter crop, and is valuable for pasturing sheep during the Winter months.

A Great Fattening Food for Horses, Cows, Sheep, Pigs, &c.

Sow now, it will catch the Autumn rains, and will be ready for pasturing in about 10 weeks. A crop is thus available for stocking before the Winter sets in.

Somner's "Tip-Top" Giant Kangaroo Rape

A sturdy and rapid grower; it has a strong tap-root, enabling it to stand long periods of drought. Stalks break easily, and are very succulent right through. **Will not taint the milk.** Sow 4 to 6 lbs. per acre in drills; 8 to 12 lbs. broadcast. **Will fatten 3 more sheep per acre than any other kind. 1/- lb.; 93/4 cwt.**

Dwarf Essex **Imported English (true).** 10d. per lb.; 84/- per cwt.
New Zealand. 9d. per lb.; 74/8 per cwt.

Write for Special Circular on Rape.

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Seed Merchants and Nurserymen

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DEPARTMENT OF AGRICULTURE, VICTORIA

Red Poll Dairy Herd

The Department will shortly have completed the orders for calves that were booked ahead of calving when the advertisement was withdrawn; consequently the booking of orders for bull calves from the forthcoming calvings has now been resumed.

BULL CALVES are sold for delivery at a month old at prices based approximately on the actual milk and butter fat record of the dam at the rate of 1s. per lb. of butter ***fat*** yielded.

(For Record of Yields of dams see Red Poll Herd Book.)

The Bulls in Use include—

LONGFORD MAJOR (Imported)

Dam's Record 14713 lbs. milk ... 6 years average 11338 lbs. milk
G. Dam's ,, 10548 ,, ... 4 ,, ,, 9155 ,,

BELLIGERENT (Imported)

Dam's Record (1st milking) 7144 lbs. milk.

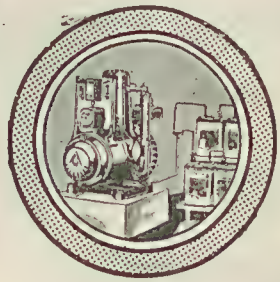
Dam's Dam's	,,	14533 lbs. milk	...	4 years average	12871 lbs. milk
Sire's Dam's	,,	10370 ,,	...	7 ,, ,,	9354 ,,
Sire's D. Dam's	,,	9510 ,,	...	12 ,, ,,	8033 ,,
G. Sire's D. Dam's	,,	10215 ,,	...	7 ,, ,,	9386 ,,
G.G. Sire's D. Dam's	,,	12565 ,,	...	10 ,, ,,	8853 ,,
G.G.G. Sire's D. Dam's	,,	10088 ,,	...	2 ,, ,,	9754 ,,

Inspection of the Herd is Invited.

Visitors will be met at the Station on notifying the Manager, State Research Farm, Werribee.

Application for purchase to

Dr. S. S. CAMERON, DIRECTOR OF AGRICULTURE, MELBOURNE.



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Delco-Light will drive the Sharples Moto-Milker

This wonderful portable two-cow milker is easily the best on the market. One man can milk a herd of 20 in 45 minutes. It is absolutely portable, and it is the one milker that has the compressed air squeeze; this gives rapid and easy milking, and the cows like it and give more milk.

Write for booklet and particulars

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Illustration of the Sharples Moto-Milker in action.

☞ Note the portability and ease of operation

DEPARTMENT OF AGRICULTURE, VICTORIA

Pure Ayrshire Bulls

for Sale

STATE FARM, RUTHERGLEN

Royal Prince of Gowrie Park

Colour, Brown and White. *Calved 30th July, 1915*

Bred by Mr. W. P. Brisbane, Gowrie Park, Weerite, Victoria.

Pedigree.

Sire: Wallace of Gowrie Park (675) A.H.B. of A.
Dam: Princess of Gowrie Park (1710) by Heather of Jock 2nd (387)
2nd Dam: Princess 4th of Luminois of Oakbank (456)
3rd Dam: Young Princess by Dahlia's Adonis (172)
4th Dam: Princess by Young Norman (225)
5th Dam: Fancy by Earl of Seafield (422)
6th Dam: Princess by Norval.

Princess of Gowrie Park yielded 8,930¼ lbs. milk with a 4·67 test in 273 days.

COLLEGE PRINCE

Colour, Brown and White. *Calved 24th September, 1917*

Bred by Department of Agriculture at the State Farm, Rutherglen.

Sire: Royal Prince of Gowrie Park by Wallace of Gowrie Park (675) A.H.B. of A.
Dam: Irene 2nd of Flinders by Glen Elgin's Combine.
2nd Dam: Irene of Flinders by Gleneira's Monsieur (546)
3rd Dam: Irene of Gleneira (1727) by Majestic of Oakbank (326)
4th Dam: Isabel of Gleneira (1036) by Red Chief (359)
5th Dam: Gaiety (1006) by Dainty Davie.
6th Dam: Princess (270) by Prince.

Irene 2nd of Flinders yielded 570 gallons of milk with a 4·2 test in 304 days.

Inspection of these Bulls at the State Farm, Rutherglen, is invited

Application for purchase to

Dr. S. S. CAMERON, Director of Agriculture, Melbourne

Sow poor—Pigs stunted—but Karswood Pig Powders soon fixed them up

No pig raiser can afford to be without Karswood Pig Powders. To give breeding sows a Karswood Pig Powder three times a week before pigging and every other day after—has been proved the finest treatment in the world. Karswood Pig Powders put the sow in fine fettle, pigging is robbed of risk, and strong litters result. Karswood Pig Powders make pigs thrive. A pig which goes "off its legs" can neither thrive nor fatten. Karswood Pig Powders put this right, as the following letter proves—

All right in one week after Karswood Pig Powders

Fulbrook Farm, Woodcote,
Reading, England.

I feel I must write to you and let you know an experience I had with a sow and litter of nine pigs I bought last February. When I purchased same the sow was very poor, and the pigs small and "stunted." The man who had owned them had been feeding the sow on "wash" and raw potatoes. When I got them home, I started feeding the sow on "wash" and "toppings" three times a day. This went on for two weeks with no improvement in either sow or pigs, and so at last I got two dozen Karswood Pig Powders. In a week there was a marked improvement, and by the time the pigs were weaned (eight weeks old) they were as good as my other litters. When I bought them I gave £16 for the lot, and sold the nine pigs for £1 each, and the sow for £14 10s.—£23 10s. altogether—thanks to Karswood Pig Powders. I have kept pigs for eleven years, and strongly recommend Karswood Pig Powders to any Pig-keepers.

R. F. HALL.

8th July, 1919.

Sow weak in hind legs. Soon fit and fat after Karswood Pig Powders

Polle Farm, Whitestone,
near Exeter, England.

I had a sow that went weak in the hind legs, and put her to fatten. The food given no doubt helped her a little, but I can say that since taking the Karswood Pig Powders she has come on in quite a surprising way. She went off her food whilst fattening, and I gave her a dose of Karswood Pig Powders and kept it up, and she took to her food at once after the dose, and has done so ever since.

M. W. FORRESTER.

17th October, 1920.

SIZES AND PRICES

Karswood Pig Powders are sold by Australian Dealers at 1s. 4d. per packet of twelve powders (with a valuable booklet on pigs, illustrated, in each packet). If your local storekeeper or produce dealer does not supply, write to the Wholesale Agent (see address below), who will send you the address of a dealer who does sell them, and see that you are supplied.

Agents for Victoria and Tasmania—

Henry Berry & Co.

Pty. Ltd.

Collins Street, Melbourne

NOTE.—Karswood Pig Powders are made in Manchester, England, by E. Griffiths Hughes Ltd., established 1756, in the reign of George the Second.

NOTE.—If supplied direct, postage or freight is charged extra.

PARSONS BROS. & CO.

Propy. Ltd.

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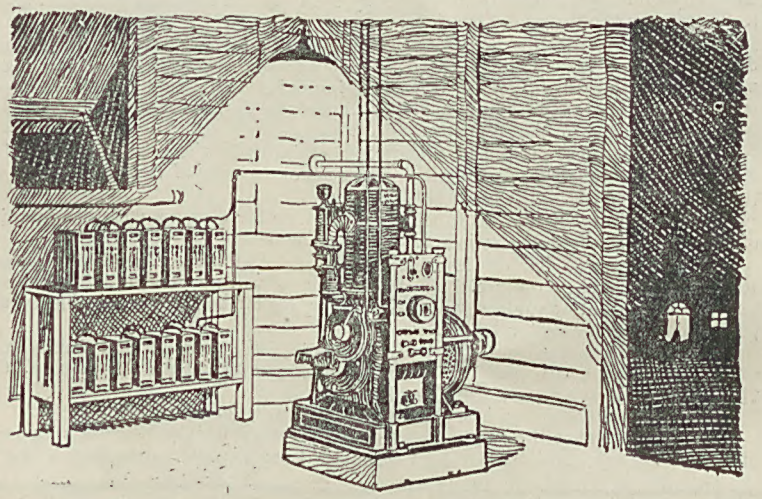

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C. R. FOSTER,

Western Electric Agent for Victoria,

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TERRITORY OF NEW GUINEA

Vacancy for Director of Agriculture

Applications are invited for appointment as Director of Agriculture in the Territory of New Guinea, administered by the Commonwealth of Australia under mandate from the League of Nations.

The duties of the Director of Agriculture will be to advise on the agricultural development of New Guinea (both as to European-managed plantations and native gardens), to supervise scientific inquiries respecting plant diseases, soils, &c., and to control and manage, under the Administrator, the Agricultural Department of the Territory.

Applicants must have had a thorough training in the sciences underlying agriculture (honors degree preferred), and some experience of tropical agriculture (coconuts preferred). Age under 40 desirable.

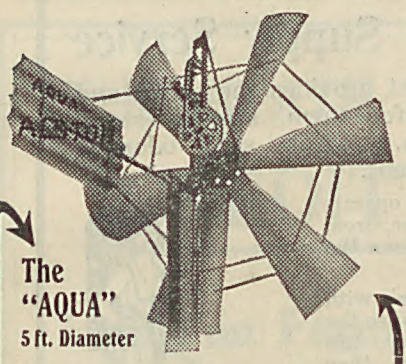
The appointment will be in the first instance for 5 years, with opportunity of renewal if services are satisfactory.

The salary will be not less than £1,000 per annum. Applicants should state the salary they require. There is no provision at present for pensions; but the successful candidate will enjoy any pension benefits applicable to the post which may hereafter be conferred.

First-class passage to Rabaul *via* Australia for appointee and family (not exceeding three adult fares) will be provided; and return passages if the appointee vacates his post at the end of five years.

Three months' leave will be granted in each two years of service.

Applications should be addressed to the Secretary, Prime Minister's Department, Melbourne, and should reach him not later than the 31st March, 1922.



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Expert Advice and Catalogue Free on Application.

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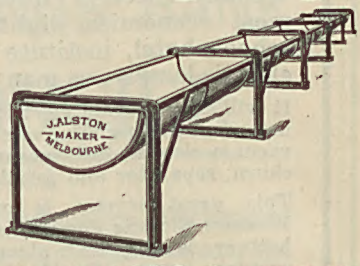

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is the influence that rejuvenates pastures, tones up heavily cultivated soils, and where orchard trees have become debilitated through heavy bearing, restores them to their former vigour and fruitfulness.

SULPHATE OF AMMONIA is easy to apply, is direct and immediate in its action, and is the richest of all known fertilizers in Nitrogen (the Staff of Plant Life).

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